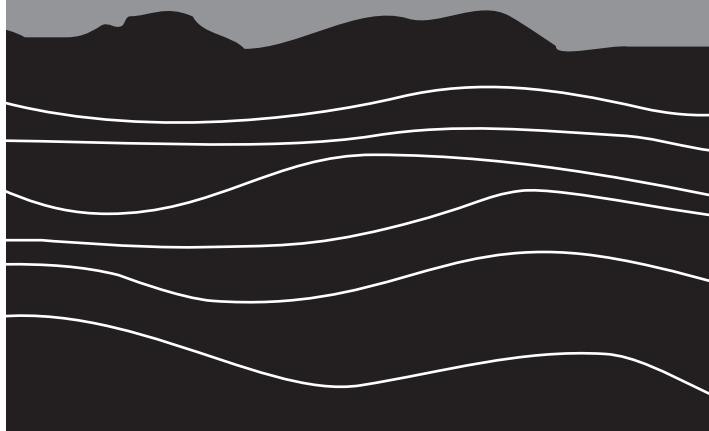


A2809

# Soil test

**recommendations  
for field,  
vegetable,  
and fruit crops**



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## **Preface**

The Wisconsin soil testing program was originally developed in the early 1960s. The program has since been revised four times (1970, 1981, 1991, and 1997) to reflect research advances, additional correlation and calibration data, changes in user needs, and shifts in philosophical viewpoint. The latest revision incorporates additional research data, eliminates inconsistencies and misconceptions, and makes the recommendations easier to understand and use.

This publication has been updated to mirror the changes made to the soil testing program. The authors take full responsibility for the recommendations made in this publication. We gratefully acknowledge E.E. Schulte and L.M. Walsh, professors emeriti of soil science, for their contributions to earlier versions. Thanks also to members of the departments of soil science, agronomy, and horticulture for their input.

## Introduction

Nearly 200,000 soil samples are analyzed in Wisconsin each year, and the results of these tests guide Wisconsin farmers in the use of lime and fertilizer. Properly used lime, fertilizer, and other nutrient sources increase Wisconsin farm income by 300 million dollars. Just as importantly, following soil test recommendations prevents overapplication of nutrients. This, in turn, reduces the potential for damage to the environment.

To most farmers, the importance of a good soil testing program is well recognized. However, some people view soil testing programs as sales gimmicks to promote greater fertilizer use. Others consider soil testing as the ultimate determination of the fertility status of soils. Reality lies somewhere between these extremes. With representative sampling, soil tests can predict lime, phosphorus, and potassium requirements with a high degree of accuracy. Soil tests can also serve as a guide for nitrogen and some of the secondary nutrients and micronutrients; however, these require special testing and, in the case of nitrogen, special sampling systems. Soil testing has some limitations, but it is the best tool available for predicting lime and fertilizer needs.

The underlying goal for Wisconsin's recommendation program is to supply enough nutrients to the crop for optimum growth throughout the season. Because nutrient demands are not uniform throughout the season, an adequate supply must be available during the period of peak demand. The Wisconsin program defines the "critical" level as the cutoff between the "optimum" and "high" soil test levels. If the nutrient supply drops below the critical level, growers face economic losses from reduced yields or poor stand quality. If the supply exceeds that level, there's a danger of mobile nutrients moving into the groundwater and surface water. In addition, there's no profit in applying nutrients that won't be used. The Wisconsin soil testing program helps you anticipate crop needs and monitor nutrient availability.

The Wisconsin soil testing program strives to (1) provide an accurate index of the level of available nutrients in the soil; (2) indicate the degree of nutrient deficiency that may exist for the various crops grown; (3) suggest how the deficiency might be corrected; and (4) provide the results in an understandable and meaningful way so that the farmer can make the appropriate decision as to what nutrients to add.

*Soil Test Recommendations for Field, Vegetable, and Fruit Crops* outlines the assumptions that have been used to develop the soil testing program, describes how to interpret the results, and explains the recommendations and rationale. For people interested in understanding how the program works, this publication also identifies the logic sequence used to generate recommendations.

## Soil sampling

Proper soil sampling is the most important aspect of the soil test. If a sample does not represent the field or part of a field, then the recommendation will be inaccurate and misleading. Complete instructions for proper soil sampling are included in Extension publication *Sampling Soils for Testing* (A2100). The basic requirements for taking good soil samples are:

1. Use a sampling probe or auger.
2. Sample to plow depth (6–7 inches deep).
3. Avoid unusual areas in the field.
4. Take a minimum of five cores per composite sample.
5. Take at least one composite sample per 5 acres.
6. Place sample in labeled bag.
7. Keep records of identification where samples were taken within fields.
8. Fill out the Soil Test Information Sheet completely. A copy is provided in the appendix.

The College of Agricultural and Life Sciences, University of Wisconsin-Madison and University of Wisconsin-Extension, through the Department of Soil Science, operates soil testing laboratories at Madison and Marshfield. Private soil testing laboratories, some of which are approved for Wisconsin Farm Service Agency (FSA) cost-sharing, are also available. All approved laboratories use similar analytical procedures and follow the University of Wisconsin recommendation program if the sample is identified as being for cost-sharing purposes. It is important to identify

samples that will be used for cost sharing as some Wisconsin FSA-approved laboratories also provide non-UW recommendations.

Quality control samples are periodically sent to each of these labs to standardize procedures and to ensure that instruments are functioning properly. A list of Wisconsin FSA-approved laboratories is available from either of the University of Wisconsin laboratories or from your county Extension offices.

To have soil tested by the University, send samples to one of the laboratories listed below. If you do not have an account with either of these laboratories, include payment with the Soil Test Information Sheet.

#### **UW Soil and Plant Analysis**

##### **Laboratory**

5711 Mineral Point Road  
Madison, WI 53705-4453  
(608) 262-4364

#### **UW Soil and Forage Analysis**

##### **Laboratory**

8396 Yellowstone Drive  
Marshfield, WI 54449-8401  
(715) 387-2523

Always include a Soil Test Information Sheet when submitting soil samples to a soil testing laboratory. For more accurate recommendations, provide the soil name and field history whenever possible. Information about legume crops previously grown on the soil and manure application history are essential for proper nutrient crediting from these sources. Include soil names from county soil survey reports or individual farm conservation plans. County Extension agents, Natural Resource Conservation Service (NRCS) district conservationists or Land Conservation Committee (LCC) employees can help obtain this information. Complete instructions for filling out the Information Sheet are given on the back of the sheet.

## **Available tests and analytical procedures**

The routine soil testing program for laboratories using the Wisconsin soil test recommendation program includes soil pH, organic matter content, lime requirement (SMP buffer pH), and extractable phosphorus and potassium. In addition, special tests may be requested for calcium, magnesium, sulfur, boron, manganese, and zinc.

Approved soil tests for copper, iron, molybdenum, and chlorine are not included at this time. These nutrients are rarely deficient in Wisconsin soils.

Preplant and presidedress soil tests for nitrogen are available for use in Wisconsin, but results of these tests are not a part of the computerized routine soil test recommendation program. Research has shown that these tests are only usable when performed in the spring or early summer, respectively. These tests provide a more accurate assessment of nitrogen need and the results are used to adjust the nitrogen needs shown on the routine soil test report forms. Different forms are used to report results of these special nitrogen tests.

Several other tests can be performed on request. These tests include physical analysis for particle size distribution (% sand, % silt, % clay), exchangeable sodium, soluble salts, total nitrogen, inorganic nitrogen, total organic carbon, and heavy metals (arsenic, cadmium, chromium, cobalt, copper, iron, lead, manganese, molybdenum, nickel, selenium, zinc). These tests are not part of the routine soil test program and the results are reported separately.

Table 1 briefly describes the procedures used for each soil test performed at University of Wisconsin laboratories and other Wisconsin FSA-approved laboratories.

Plants require micronutrients in very small amounts. Interpretation of soil tests for these nutrients are not as reliable as those for phosphorus and potassium because of possible subsoil contributions and incomplete calibration. A better method for assessing the micronutrient status of the crop is to analyze the plant tissue in conjunction with soil analysis. Plant analysis is available at the Soil and Plant Analysis Laboratory, 5711 Mineral Point Road, Madison, WI 53705-4453, and some private laboratories.

## **Explanation of the Soil Test Report**

The Soil Test Report is divided into five major sections. The field information and macronutrient recommendations for the field are shown at the top. Any additional comments or special situations are noted in the comments section. The middle of the page provides graphic interpretations for the field soil test results for each crop in the rotation. The bottom two sections are the laboratory results for each sample provided for this field and any secondary or micronutrient recommendations, respectively.

Field information is reported in the upper left section of the Soil Test Report. This information comes from the field history provided on the Information Sheet.

Field recommendations for lime and fertilizer are presented at the top of the report. These recommendations are based on the adjusted results of all samples from one field. Aglime recommendations for the specific crop sequence are presented directly beneath the fertilizer recommendation. The amount of aglime needed to raise the soil pH to the most lime-demanding crop in the sequence is shown for two different lime grades, those with neutralizing indexes of 60-69 and 80-89.



When soil tests for phosphorus or potassium are in the optimum range, profit is maximized by applying nutrients at rates about equal to the amounts in the harvested part of the crop. Soils testing very low or low in phosphorus or potassium will require additional nutrients. Following the recommendations will gradually increase the nutrient levels in soil, so soils should test in the optimum range for the crop rotation after 8–10 years. Soils testing high or very high receive reduced recommendations since these soils are already above the desired soil test range. In the excessively high category, no fertilizer is recommended because response to added phosphorus or potassium is extremely unlikely. However, for row crops it may be desirable to use starter fertilizer at planting time, especially on soils that are slow to warm. Apply 10 lb/a nitrogen (N), 20 lb/a phosphate ( $P_2O_5$ ), and 20 lb/a potash ( $K_2O$ ) as starter fertilizer, placing it at least 2 inches from the seed.

The fertilizer recommendations on the Soil Test Report are adjusted for previous legume crops or applied manure if this information is given on the Information Sheet. These adjustments are shown in the recommendation portion of the report. The recommendations assume that conventional practices are used. Where other practices have been used, make adjustments as shown on the back of the report against the recommended fertilizer needs. The nutrients can be applied as a combination of manure, legume, commercial fertilizer, or other nutrient source. The method of application can be a combination of row treatment and broadcast treatment, or it may be applied entirely in the row or entirely as a broadcast treatment. The decision on how to apply the required

nutrients depends largely on the total amount needed and the farmer's chosen nutrient management program preference.

The graphic presentation of the interpretations of the average soil test for P and K are shown in the center section of the report. Lines of repeated "P"s and "K"s will extend into the appropriate interpretation level for each indicated crop. **The best, and most profitable, strategy is to maintain soil test levels in the optimum range with adequate nutrient additions.** The pH is also interpreted based on the most acid-sensitive crop in the rotation. These graphs have the added benefit of showing where the soil test falls within the interpretative range for each crop.

The laboratory analysis for each sample and an adjusted field average are presented on the lower portion of the report. Routine soil tests include soil pH, buffer pH, organic matter, phosphorus, and potassium. Additional tests for calcium, magnesium, sulfur, boron, manganese, and zinc may be run if requested. Organic matter results are reported in percent and nutrient tests are reported in parts per million (ppm).

The bottom of the Soil Test Report is reserved for interpretation of results of micronutrient tests.

The back of the report form provides a brief explanation of some of the sections of the Soil Test Report. At the bottom there is also a work space provided. Three identical sections are shown, one for each of three crop seasons. Space is also reserved for recording actual nutrient applications as they are made.

## Interpreting soil test results

### Macronutrients

Soil tests for phosphorus and potassium are indices of "available" nutrients present in the soil. These indices provide estimates of the amount of additional phosphate or potash that should be added to optimize profit for the farmer.

Analytical results for phosphorus (P), potassium (K), and special tests (calcium, magnesium, sulfur, boron, manganese, and zinc) are reported as parts of nutrient per million parts of dry, ground soil. (For details about this measurement, see section on sample density.) To convert parts per million (ppm) to pounds per acre, multiply ppm by 2. If the amount of phosphorus in the sample exceeds 200 ppm, it will be reported as 200+ ppm. Similarly, if potassium exceeds 999 ppm, it will be reported as 999+ ppm.

Farmers have asked for specific interpretation of their soil test results to know whether their soils are relatively low, optimum, or high in availability of a given nutrient. Research in Wisconsin has shown that the interpretation of soil tests varies with test results, subsoil fertility group, and specific crop needs. The center section of the updated report form provides the P and K interpretations graphically for each of the crops in the indicated rotation and the soil acidity (lime) interpretation for the most acid sensitive crop. The definitions of the interpretative levels used to indicate the soil relative nutrient supply of phosphorus and potassium are shown in table 2.



When a soil test for phosphorus or potassium falls in the very low (VL) or low (L) category, the grower can probably use more nutrients profitably; if a soil test falls in the optimum (Opt) or medium range, no adjustment is needed in the current fertilizer program and future applications should be about at the level of nutrients removed by crop harvest; if the soil test falls in the high (H) or very high (VH) range, the grower should continue to apply some nutrients, but at rates lower than have been used in the past; and if the test is in the excessively high (EH) range, nutrient applications can be omitted for at least 2–3 years.

Tables 4–6 identify the relative crop need and phosphorus and potassium soil test levels associated with these interpretative categories. Refer to tables 14–19 for the suggested levels of needed phosphate and potash to apply at these soil test levels.

### Secondary nutrients and micronutrients except sulfur

Crops vary greatly in their need for secondary nutrients and micronutrients. If the soil is low or deficient, response to application of that nutrient *likely will* occur if the crop has a “high” requirement for the micronutrient; response *probably will* occur if the crop has a “medium” requirement; and response *likely will not* occur if the crop has a “low” requirement. Therefore, soil test levels for these nutrients can only be interpreted in relation to the amount needed by the crop. Relative crop micronutrient needs and specific soil test level interpretations for the secondary and micronutrients are provided in tables 7 and 8. When these tests are performed, the interpretations and recommendations will be shown as comments at the bottom of the report.

### Sulfur

The Wisconsin soil test recommendation program interprets sulfur (S) need by estimating total sulfur inputs from several sources in addition to the

sulfate-sulfur measured in the plow-layer. These inputs include estimates of sulfur released from organic matter, sulfur in precipitation, subsoil sulfur, and sulfur in applied manure. The total from these inputs is expressed as the sulfur availability index (SAI). When the SAI is high, no sulfur is recommended; when it is medium, we recommend confirming the need for sulfur through plant analysis; and when it is low, sulfur is probably needed and should be applied. The calculations and assumptions used are described in detail in the section called Recommendations for Secondary Nutrients and Micronutrients.

### Organic matter

The organic matter test primarily measures the humus (decomposed plant and animal residues) in the soil and is not appreciably changed by adding fresh organic matter in the form of manure or crop residues. Since organic matter content cannot be changed easily, soil test levels for organic matter are reported but not interpreted. The amount of organic matter that a soil contains depends largely on the original vegetation, soil texture, drainage, length of time under cultivation, tillage system, and degree of erosion.

Organic matter content is reported as a percentage of dry soil weight based on analysis by loss of weight by ignition (LOI). Table 3 describes the approximate amount of organic matter characteristic of various Wisconsin soils.

### Soil pH

Crops vary in their optimum soil pH level, and there is a marked difference between the optimum soil pH for mineral and organic soils. The recommended pH for various soils and crops are listed in table 4. Because most crops in Wisconsin are grown in rotation, the soil should be limed to the optimum pH for the most acid-sensitive crop in the rotation. The lime interpretation and recommendation shown on the report form is for this crop.

No interpretation is made for the SMP buffer pH (shown on the report form as “lab use buffer code”). This value is used to calculate the lime requirement when the soil pH is below 6.6. If the soil pH is 6.6 or higher, the SMP test is not performed. In this case, “NR” is printed in the buffer code column, with the comment that the test is not required for calculation of lime requirement when the soil pH is 6.6 or higher (comment 3).

The pH of the SMP buffer solution is 7.5. When mixed with the soil, the buffer reacts with soil acids and the pH of the buffer solution drops. The soil lime requirement is proportional to the drop in pH of the soil-buffer mixture. The total lime requirement is calculated using pH of the SMP buffer-soil mixture, soil water pH, and organic matter content of the soil and is adjusted for plowing depth.

### Sample density

Sample density is used to help estimate organic matter and cation exchange capacity (CEC). Sample density is not the same as field bulk density since it is determined on a dried, ground sample. It is determined from the mass of oven-dry soil (110°C) and the volume of the soil subsample (4.25 cm<sup>3</sup>). Results of the routine soil tests for nutrients are reported as parts per million (ppm) implying weight per unit weight. However, the actual test value is a weight per unit volume because the amount of soil used is that quantity which fits into a 4.25 cm<sup>3</sup> scoop. For a light-colored silt loam soil this is approximately 5.0 grams. The soil test ppm unit is calibrated with the assumption that an acre plow layer to 6.67 inches depth weighs 2 million pounds. This assumption introduces some error into the results, especially for very sandy or very high organic matter soils. The Wisconsin program does not adjust for soil texture or organic matter. For most users, sample density is not a meaningful number.

## Recommendations, rationale, and methods

The crops for which fertilizer recommendations are available, the code for each crop, and the appropriate fertilizer recommendation tables for each are shown in table 4. The target or desired pH levels for each crop and the relative nutrient need for phosphorus and potassium (demand level) are also given. Phosphorus and potassium recommendations are given in tables 14–19, nitrogen recommendations in tables 20–22, and secondary and micronutrients in tables 26–27.

All samples bearing the same field letter or number from one farm are considered to be from the same field, and results are averaged when making a recommendation. A different recommendation is made whenever the field designation changes. Therefore, all samples from any one field must carry exactly the same field designation using not more than eight digits and/or letters. Abbreviate the field designation if necessary. If you’d like separate recommendations for certain samples in a given field, you must give these samples separate field designations. Special arrangements need to be made with the laboratory for only reporting data for grid-sampled fields.

Out-of-state samples will receive recommendations only if the soil name is given *and* it corresponds to a soil name used in Wisconsin. When no soil name is given, or if the soil name is not used in Wisconsin, only analytical results will be presented. The University of Wisconsin does not provide recommendations for these samples because there is no assurance that calibration using Wisconsin soils is appropriate for other soils. A comment will direct the farmer to their county Extension agent (comment 1).

## Cropping sequence

The program allows growers to specify cropping sequences containing up to three different crops for each field. Nitrogen, phosphorus, and potassium needs are interpreted and recommended for each crop independently, and lime is recommended for the most acid-sensitive crop in the sequence.

If no crop sequence is specified, recommendations for a corn/oats/alfalfa rotation are given.

## Aglime recommendations

Aglime recommendations are given to lime the soil for the specific crops which will actually be grown. Users are cautioned that if alfalfa will be grown on a field in the future, but is not indicated in the present rotation, the field lime needs may be underestimated.

## Target pH

The optimum pH for a soil depends on the crops that will be grown. See table 4 for a list of the optimum pH levels for crops grown in Wisconsin. The amount of lime recommended is the amount needed to reach the target pH for the most acid-sensitive crop (the one with the highest target pH) for that crop sequence. If potatoes are part of the sequence, the target pH is limited by this crop and the program prints the optimum pH for scab-susceptible potatoes in the comments section (comment 44).

Once a soil reaches the desired pH level, it will tend to remain at that level for quite a long time without additional application of aglime. Two factors contribute to the stability of soil pH: most soils are highly buffered against changes in pH and crops remove only small amounts of calcium and magnesium relative to the amount applied in dolomitic limestone.

## Lime requirement calculations

The program calculates the lime requirement if the pH is more than 0.2 units below the target pH. Minor fluctuations inherent in both sampling and pH measurement preclude calculating lime needs when the pH is within 0.2 units of the target. The equations (given in table 9) use soil pH, SMP buffer, and soil organic matter. The soil organic matter is estimated by measuring the weight loss upon ignition. The first number in the equations is an adjustment to compensate for inefficient field mixing and incomplete dissolution of ground limestone.

The program provides recommendations for liming materials with neutralizing indices (NI) of 60-69 and 80-89. The 60-69 NI recommendation is rounded to the nearest whole ton. The 80-89 NI is calculated from the rounded 60-69 NI recommendation and is itself rounded to the nearest 0.5 ton. Recommendations for potatoes are rounded to the nearest 0.1 ton. If using lime with an NI other than 60-69 or 80-89, adjust the lime requirement using the following formula:

Lime requirement  
(ton/a)  
of lime being used

=

ton/a  
60-69 lime  
recommended

x

65  
NI of lime  
being used

## Plow depth adjustment

The depth of tillage is taken into account when calculating the amount of lime needed. The default plow depth is 7 inches unless otherwise indicated on the Soil Information Sheet. When a plow depth greater than 7 inches is specified, the lime recommendation is adjusted by the plow depth factor shown below.

| Plow depth      | Factor used to adjust<br>lime recommendations |
|-----------------|---|
| 0–7.0 inches    | 1.00  |
| 7.1–8.0 inches  | 1.15  |
| 8.1–9.0 inches  | 1.31  |
| Over 9.0 inches | 1.46  |



### Averaging the lime requirement

The lime requirement (LR) is calculated separately for each sample. If the pH of any sample matches or exceeds the target pH, the lime requirement for that sample is zero. When more than one sample per field is submitted, the lime requirements for all samples within the field are averaged. Each sample LR is then compared to the mean LR. If a sample *exceeds* the mean by more than 2 tons/a, the arithmetic mean for the field is printed in the lime recommendation line, and a statement is printed indicating that a variable amount of lime is needed for the more acid part of the field (comment 25). If a sample is more than 2 tons/a *below* the mean, it is excluded and a new mean is calculated. If only three or four samples were submitted from a field, no more than one sample can be eliminated. If five or more samples were submitted, no more than two samples can be excluded. The “adjusted average” field LR is then printed in the lime recommendation area based on this new mean for the crop rotation.

### Other factors affecting lime recommendations

When the average per-sample recommendation is for 1 ton/a of lime, the field recommendation for 60-69 grade aglime is increased to 2 ton/a and for 80-89 grade aglime is increased to 1.5 tons/a on most soils. However, on sandy soils with an average organic matter content of less than 1%, the field recommendation is limited to 1 ton/a of either grade when the average per-sample recommendation is less than 1.5 tons/a. This modification prevents overliming light-colored, sandy soils.

The total amount of aglime recommended is limited to 8 tons/a for potatoes and 12 tons/a for other crops even though more aglime may be required to completely neutralize soil acidity. In this situation a comment is printed cautioning the farmer that the target pH will not be reached, but that a smaller application is recommended for economic reasons (comment 26). If the field has been limed in the last 2 years,

additional lime may not be needed, even though a lime recommendation may be given. A special statement is printed stating that more lime may not be needed due to the incomplete neutralization reaction of the previously applied lime (comment 28).

### Phosphate and potash recommendations

If the soil test for a nutrient is low, there is a high probability that a crop will respond to applications of that nutrient. When soil test values are greater than optimum, the chances of obtaining an economic response are relatively low. A crop can use nutrients from the soil and/or from the nutrients applied as fertilizer, manure, or other materials. The Wisconsin soil test recommendation program recognizes that nutrients can come from any of these sources. As a result, the objective of the program is to recommend levels of applied nutrients to maximize profitability while minimizing the risk of potential environmental problems. This means storing somewhat lower quantities of nutrients in the soil and optimizing the return to the farmer through annual nutrient applications.

### Factors affecting phosphorus and potassium recommendations

To determine fertilizer needs accurately, one must consider the various factors such as crop demand level, subsoil fertility, the yield potential of the soil, and the farmer's yield goals. The procedure used to consider each of these factors is discussed below.

**Crop demand level.** Each crop requires varying levels of available phosphorus or potassium to optimize yield. The program places crops into one of six phosphorus and potassium demand levels based on their relative nutrient need: (1) corn; (2) soybeans and low demand level field crops; (3) alfalfa, irrigated field crops, and low demand level vegetable crops; (4) red clover and medium demand level field crops; (5) high demand level vegetable crops; and (6) potatoes. Table 4 identifies the specific demand levels for various crops.

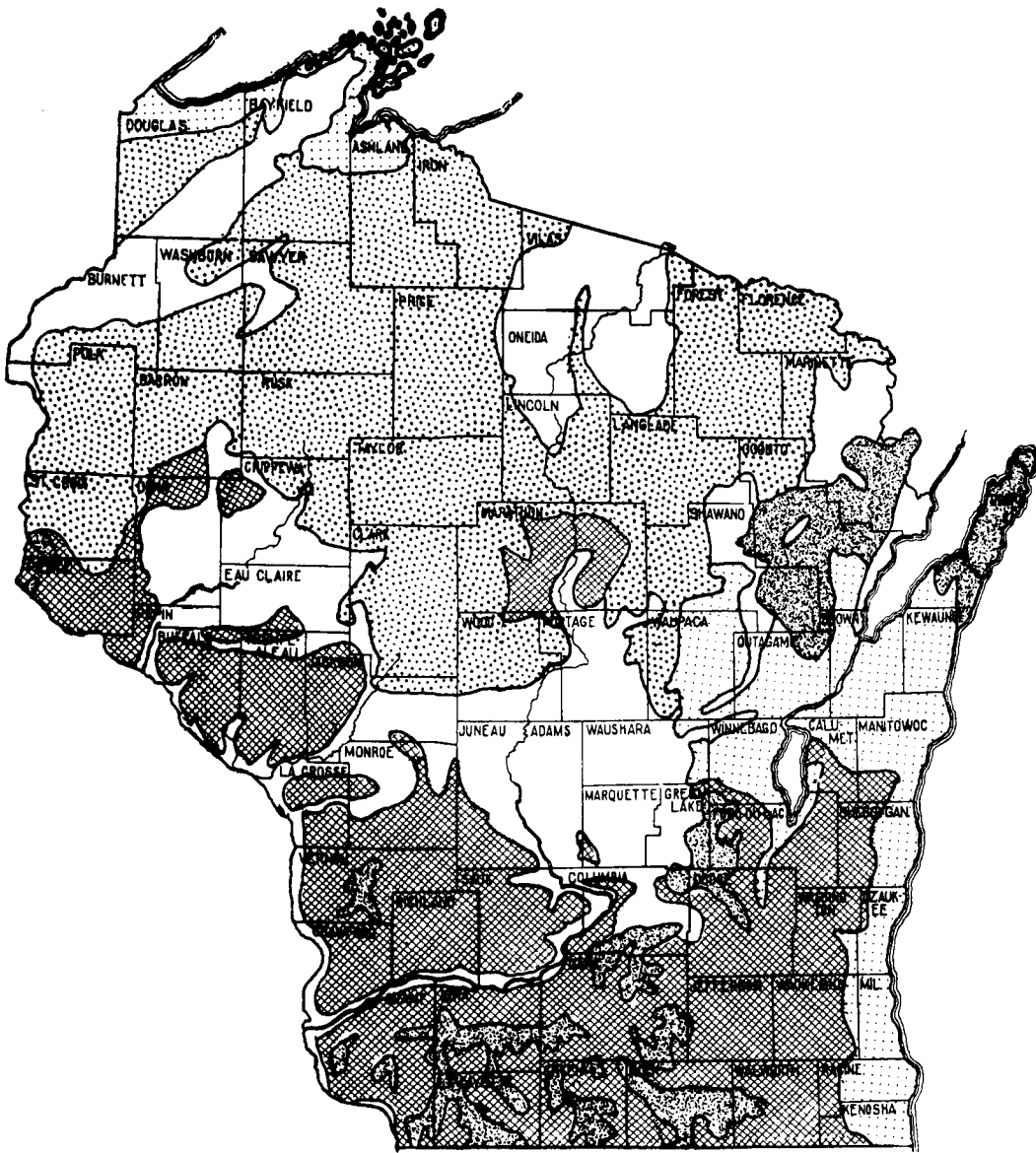
Crops grown on soils testing in the optimum range will have optimum yield and profit when the quantity of nutrients applied equals about the amount in the harvested part of the crop. Tables 5 and 6 show the soil test interpretative ranges for each demand level and soil group.

The optimum soil test ranges for phosphorus and potassium are set somewhat higher for vegetables, potatoes, and irrigated field crops because of their high crop values. Nutrient recommendations for crops grown on sands and organic soils are limited by the nutrient holding capacity of these soils, particularly for potassium. Because potassium leaches readily from organic soils and irrigated sands, and because specialty crop growers tend to use larger amounts of fertilizer, soil test values may fluctuate rapidly. For this reason, conduct soil tests for vegetable crops and irrigated field crops every year or every other year. Where it is indicated that the field is irrigated and the crop demand level is 1, 2, or 4 then the field will be reassigned to crop demand level 3; a comment will print indicating that this field has been assigned a top yield potential and that it should be retested frequently (comment 29).

**Subsoil groups.** Subsoil groups are based on the subsoil nutrient supplying power of the soil. This, in turn, affects the optimum soil test level of the plow layer in relation to crop needs. Subsoil groups are also used to determine the amount of fertilizer required to change the soil test level by 1 ppm (the soil nutrient buffering capacity).

Since subsoils vary considerably in their ability to supply phosphorus and/or potassium, tests for the surface soil (plow layer) must be calibrated based on the different subsoil types. Wisconsin soils have been divided into five different subsoil groups (A, B, C, D, and E) according to the relative levels of available phosphorus and potassium in the subsoil. The approximate location of these groups and their relative levels of subsoil fertility are shown in figure 1. In

**Figure 1.** General subsoil fertility groups, based on available phosphorus and potassium in subsoils



| Subsoil group | Legend | Nutrient supplying power <sup>a</sup> | Nutrient buffering capacity <sup>b</sup> |                  |
|---------------|--------|---------------------------------------|--|------------------|
|               |        |                                       | P <sub>2</sub> O <sub>5</sub>            | K <sub>2</sub> O |
| A             |        | P high, K medium                      | 18                                       | 7                |
| B             |        | P medium, K medium                    | 18                                       | 7                |
| C             |        | P low, K high                         | 18                                       | 7                |
| D             |        | P medium, K low                       | 18                                       | 7                |
| E             |        | P variable, K low                     | 12                                       | 6                |
| O             |        | P variable, K low                     | 18                                       | 5                |

<sup>a</sup>All data refer to subsoils (8" to 30") only. Low, medium and high ratings are relative and are not defined in absolute units. Adapted from M.T. Beatty and R.B. Corey, 1961.

<sup>b</sup>The soil nutrient buffering capacity is the approximate amount of fertilizer in lb/a (oxide basis) required to change the soil test level (elemental basis) by 1 ppm.



addition, two other groups are included because of special fertility management considerations. These are the organic soils (group O) and the high pH soils (group X) of the state. Subsoil group X is used only for the phosphorus recommendation.

Providing a soil name on the Soil Test Information Sheet will ensure that the proper subsoil group is used in determining the recommendation. Table 10 lists the subsoil group code for each soil name. When a soil name is given, it will appear on the Soil Test Report in the identification section. If a soil name is not given, the program assigns a subsoil code based on the pH, texture, color and organic matter content of the soil, and the county where the sample originated. Table 11 shows the default criteria used for determining the code.

After the proper subsoil group is determined, the phosphorus and potassium test results for the sample are compared with the interpretation values given in tables 5 and 6. (Refer to table 2 for the general interpretations of each category.) The lower limit for the excessively high (EH) category is set so that 2–4 years of crop nutrient removal without fertilizing will not significantly lessen profit. The soil should be retested again in 3 years. Soils with relatively low buffering capacities (subsoil groups E and O) should be monitored more closely by testing every 2 years (comment 31). These soils do not hold sufficient potassium to allow for several years of high yielding crops when the whole plant is removed (e.g., corn silage or alfalfa). If the subsoil group is “O,” a comment will be printed stating that this soil is not suited for growing alfalfa (comment 33). No alfalfa recommendations will be given for this subsoil group.

**Yield goal.** Realistic yield goals for the specified crops should be identified when the samples are submitted for analysis. Higher yields will require higher amounts of applied fertilizer. Yield goals should not be higher than 10 to 15% above the previous 3–5 year

average. Where a yield goal is requested which is higher or lower than any acceptable category, the program will default to the highest (or lowest) acceptable yield goal (table 12). In addition, comment 34 will be printed indicating that the specified yield goal is outside the expected range for this soil and that recommendations reflect more typical yields.

When the yield goal is not supplied, the program assigns a default yield. For corn and alfalfa, the yield potential is based on the average county yield potential (table 13). In these situations, recommendations for the typical yield assigned for corn and alfalfa for that yield potential group will be given (table 12). For soybeans, the assigned default yield goal is 50 bu/a; for red clover and birdsfoot trefoil the default is 3 tons/a. For all other crops, the middle yield goal range is used (tables 17 and 18).

### Writing the recommendations

The actual amount of phosphorus or potassium recommended for a field is found by comparing the phosphorus and potassium values of the samples tested against the values shown in tables 5 and 6. This interpretation is then used with the recommended amounts in tables 14–19 to determine the printed recommendation. The decision is based on the following factors:

- **crop to be grown**—this identifies the appropriate demand level;
- **subsoil fertility group**—this provides the relative nutrient need;
- **current soil test**—this determines the interpretative level and chance for response to nutrient additions;
- **yield goal**—this establishes the actual amount of recommended nutrients.

When soil tests are in the optimum range, nutrient recommendations are set for a rate approximately equal to the amount removed in the harvested part of the crop. When soil phosphorus or potassium is below the optimum range, additional phosphate or potash will be

recommended beyond the amount removed by the crop. This will improve crop yields and slowly build the nutrient levels to the optimum range. If soil tests are high or very high, the recommendations will be for approximately one-half or one-fourth, respectively, of the nutrients removed by the crop. No fertilizer is recommended for soils testing in the excessively high range, except for a small amount of starter fertilizer on soils that warm slowly in the spring. For some crops, such as potatoes, starter fertilizer is recommended on all soils.

Research has shown that when nutrient levels are higher than optimum, there are few yield benefits to additional nutrients. The money spent on fertilizer might be better spent on other farm enterprises. In addition, extremely high nutrient levels may cause nutrient imbalance problems and may pose an environmental risk. By following these recommendations for soils testing high to excessively high, the soil nutrient level will gradually be reduced to optimum. Retest every 3 years to check soil test levels. Where alfalfa is one of the indicated crops, increase topdressed  $K_2O$  by 20% if stand persistence is of primary importance and the stand is to be maintained for more than 3 years.

Where the soil phosphorus test is between 76 and 150 ppm and the crop rotation does not include a high P-demanding crop (demand level 5 or 6), phosphorus applications from fertilizer and/or manure should be reduced and crops that have a high demand level should be grown (comment 21). If the soil test exceeds 150 ppm, no additional phosphorus should be applied until levels are drawn down (comment 10).

### Sample averaging

The fertilizer recommendations for phosphorus and potassium are based on the average of all samples from a given field. If an individual sample is significantly higher than the average, then the value for that sample is eliminated and the average is

recalculated. The remaining values are then reexamined against the new mean. For phosphorus, values that exceed the mean by more than 5 ppm are removed; for potassium, values that exceed the mean by more than 20 ppm are removed. Where only two samples are submitted for a field, no samples can be discarded. No more than one soil sample will be eliminated from fields with three or four samples, and no more than two soil samples will be excluded from fields containing five or more samples.

The “adjusted average” phosphorus and potassium values for the field are compared with the values listed in tables 5 and 6 for the appropriate interpretative level based on crop, subsoil fertility group, and yield goal. The nutrient recommendation for the field is written on the Soil Test Report.

## Nitrogen recommendations

Most nonleguminous crops need substantial amounts of applied nitrogen to optimize crop yields. However, excess nitrogen can hurt yields and/or quality and degrade parts of the environment. Wisconsin’s recommendations attempt to balance production benefits against associated environmental risks and are based on field calibration studies. They vary according to the crop to be grown within the context of a specific soil and yield potential and the soil organic matter content.

### Corn

The optimum nitrogen rate for corn was developed through experiments that measured plant response on various soils. These studies found that the optimum nitrogen rate for corn grown on a given soil tends to be similar in high- and low-yielding years. This means that, although the optimum rate is the same, the plant uses nitrogen much more efficiently in good-yielding years, resulting in higher recovery of available nitrogen by the crop. Apparent recovery of fertilizer nitrogen by corn is

high under favorable growing conditions and low when growing conditions are poor or include stress such as drought.

**Base nitrogen rate.** The corn nitrogen recommendations are shown in table 20. Sandy soils (sands and loamy sands) are given separate recommendations depending on whether or not they are irrigated. The lower recommendation for non-irrigated sandy soils reflects the lower yield potential where moisture is inadequate. Recommendations for all other soils (medium- and fine-textured soils) are based on organic matter content and soil yield potential. All irrigated nonsandy soils are presumed to be yield potential 1 soils, and therefore receive the higher nitrogen recommendation. Results of nitrogen response experiments have shown that after adjustment for organic matter content, optimum nitrogen rates for corn are similar for forest- or prairie-derived silt loams in southern Wisconsin and for the eastern red soils. Optimum nitrogen rates are generally lower for the northern silt loam soils.

The primary factor for establishing the base nitrogen rate is the yield potential of the soil. Very high yielding and high yielding soils (codes 1 and 2) receive higher recommendations than medium and low yielding soils (codes 3 and 4). The soil name, when provided, is the first criteria for assigning samples to a subsoil fertility group and soil yield potential (table 10). This designates the appropriate nitrogen recommendation column in table 20. This base nitrogen recommendation is then adjusted for organic matter.

When the soil name is not provided, the recommendation is made on the basis of texture code (sands versus other soils), county of origin (table 13), and soil organic matter level. Since the separation between the yield potential groups corresponds approximately to the line marking the accumulation of 2300 growing degree days between May 1 and September 30 (50°F base

temperature), counties south of this line are assigned higher yield potentials (codes 1 or 2) and counties north of the line are assigned lower yield potentials (codes 3 or 4). Basing nitrogen recommendations on yield potential prevents the possibility of obtaining different recommendations for the same soil when it occurs in different parts of the state. Sandy soils, those with a subsoil group E or texture code 1, will have a statement printed in the comments section cautioning that the nitrogen should be applied in delayed (sidedress) or split applications (comment 35).

**Nitrogen adjustments.** The base nitrogen recommendations for corn should be considered the maximum amount needed for optimum yields and conventionally tilled fields if no nitrogen is supplied from other sources, such as manure or previous legume crops, and if nitrogen carryover is minimal. Nitrogen recommendations will be adjusted if information about manure applications and previous legume crops is provided with the soil sample (tables 23–25). If the field is corn after corn and conservation tilled or no till with greater than 50% residue after planting, the nitrogen recommendation will be increased by 30 lb N/a. The user can make further adjustments for soil nitrate content if the preplant or presidedress soil nitrogen test has been performed. Adjustments based on these tests are separate from the routine soil test program.

When following these nitrogen recommendations, remember that as you increase nitrogen rates to the economic optimum, crop recovery of nitrogen decreases and the potential of nitrate loss to the environment increases. Therefore, the risk of nitrate loss to groundwater is lower at nitrogen rates below the economic optimum; however, yields and economic returns are also likely to be lower. See Extension publication *Nutrient Management Practices for Wisconsin Corn Production and Water Quality Protection* (A3557) for



additional information on this subject. Nitrogen rates below those recommended for optimum yields can be selected to accomplish individual management or environmental objectives. Yields achieved at these rates will vary depending on corn growing conditions and management level. Nitrogen deficiencies are possible at nitrogen rates below those recommended for optimum yields.

### Other crops

Nitrogen recommendations for crops other than corn are also based primarily on soil yield potential; however, there is little research data showing nitrogen response for these crops on individual soil types. Therefore, a single nitrogen recommendation for a high, but achievable, yield level will be given for all crops except corn and potatoes. These recommendations, given in table 22, are adjusted for soil organic matter content. The potato nitrogen recommendations (table 21) use yield goal as a criteria primarily to help separate early, short-season varieties from longer, full-season varieties. For further adjustments for potato nitrogen management, see Extension publication *Commercial Vegetable Production in Wisconsin* (A3422).

### Fertilizer replacement credits

When the Information Sheet shows that manure was applied or that a legume was the previous crop, the program automatically adjusts the recommendations to account for these nutrient sources. Fertilizer replacement credits are assigned for any of the 3 years in the rotations where the previous crop was a legume. An indicated manure application is assumed to precede year one. Since cropping plans or manure applications may change, especially for years two or three of the rotation, you may need to adjust the nutrient credits closer to the actual cropping year. If no information was recorded on the Information Sheet

about past legume crops or manure applications, the program makes no adjustments to the recommendations.

### Manure

For each ton/a of solid dairy manure applied, 3 or 4 lb/a of available nitrogen (depending on incorporation), 3 lb/a of available  $P_2O_5$ , and 8 lb/a available  $K_2O$  are subtracted from the recommendations. Table 23 shows the assigned fertilizer replacement credits for several types of liquid or solid manure for single or repeated applications. If you've had a manure analysis performed, credit 25–60% of the total nitrogen (depending on animal species and incorporation), 55% of the total  $P_2O_5$ , and 75% of the total  $K_2O$  against the nutrients needed for the first year crop after application. This adjustment for analyzed manure must be made by the individual farmer. See Extension publication *A Step-by-Step Guide to Nutrient Management* (A3568) for additional information.

The residual manure nutrient credits are shown in table 24. For nitrogen, the second- and third-year manure credits are equal to 10% and 5%, respectively, of the applied manure N rounded down to the nearest 0.1 pound increment. For example, second-year N credits for solid dairy manure are 1.0 lb N/ton. Third-year credits are 0.5 lb N/ton, half the value of the second-year credits. Second- and third-year phosphate and potash manure credits are based on the initial amount of available nutrient applied and the anticipated amount removed in the first- and second-year harvested crops. If more manure nutrients are applied than will be removed by the crop that year, the remainder is assumed to be available to subsequent crops. Where a combination of manure nutrients and fertilizer are used to meet the crop nutrient needs, the recommended phosphate will be rounded up to the nearest 5 lb increment and potash to the nearest 10 lb increment.

If manure application is indicated but no rate is given, the program defaults to 15 tons/a of solid dairy manure. If liquid manure is indicated but no rate is given, the program defaults to 6000 gal/a of dairy manure. Consult Extension publications *Nutrient Management: Practices for Wisconsin Corn Production and Water Quality Protection* (A3557) and *Guidelines for Applying Manure to Pasture and Cropland in Wisconsin* (A3392) for more information.

### Legume sod

Plowing down alfalfa sod provides significant amounts of nitrogen for future crop use. The specific amount available depends on soil type, stand density, and amount of regrowth when the stand was killed (table 25). If regrowth is less than 8 inches at the time of tillage or killing by herbicide, the nitrogen credit for good stands is reduced by 40 lb/a. Nitrogen credits for red clover and birdsfoot trefoil are reduced to about 80% of that for alfalfa. Second-year credit of 50 lb/a is given if the legume stand was greater than 30% when it was plowed down. If the percent stand is not provided, the program defaults to a "fair" (30–70%) stand with little regrowth. No adjustments are made for the different tillage systems used.

### Soybeans

Where the previous crop was soybean, a credit of 40 lb N/a is given. This credit will also apply for soybean grown in years two or three in the sequence and is irrespective of residue return. No credit is given for this crop on sandy soils.

### Legume vegetables

A credit of 20 lb N/a is given when the previous crop was a leguminous vegetable, including snap, lima, kidney, dry, or navy beans, canning, chick, field, or cow peas. This credit is not given on sandy soils.

## Recommendations for secondary nutrients and micronutrients

Soil test interpretations for the secondary nutrients and micronutrients vary between nutrients, soil texture, soil pH, and organic matter level (table 7). When a soil test falls into the very low (VL) or low (L) range, recommendations are given unless the crop has a low requirement for the nutrient (table 8). For example, if a field of alfalfa tested very low for manganese and zinc, no recommendations would be provided because alfalfa has a low requirement for both micronutrients.

### Secondary nutrients

**Calcium.** Calcium (Ca) is unlikely to be deficient for most crops if agronomic recommendations are followed. Under Wisconsin conditions, the soil pH would likely have to be below 5.0 before calcium deficiency was apparent for most crops. Where plant storage organs are not part of the plant water transpiration stream (such as with potatoes and apples) and where soil test calcium is low, supplemental calcium may improve crop resistance to diseases and/or yield or quality.

Claims are made that an “imbalance” sometimes exists between calcium and magnesium (Mg) levels in the soil. Proponents of this theory have suggested that Wisconsin soils are adequate in calcium but contain excessive or harmful levels of magnesium. They suggest that calcitic limestone ( $\text{CaCO}_3$ ) or gypsum ( $\text{CaSO}_4$ ) is needed to correct this condition. At present, no research data exists to support this claim. Soil test level has proven to be a much more reliable predictor of nutrient need than the ratio of nutrients. Similarly, there is no evidence to support claims that magnesium is toxic or that Wisconsin soils have calcium to magnesium ratios that are too low. Research shows that calcium to magnesium ratios for virtually all Wisconsin soils fall within a rather wide optimum range. Applying

calcitic limestone or gypsum for the purpose of adding calcium or changing the calcium to magnesium ratio is not recommended. Dolomitic limestone has a calcium to magnesium ratio close to that found in most crops.

For additional information on calcium see Extension publications *Soil and Applied Calcium* (A2523) and *Soil Calcium to Magnesium Ratios—Should You Be Concerned?* (G2986).

**Magnesium.** The magnesium content of Wisconsin soils varies widely, but in most instances use of dolomitic limestone has prevented magnesium deficiency. Some soils in the state, however, are low in magnesium. These soils usually are (1) where applied liming materials are low in magnesium (examples include paper mill waste, marl, or sugar beet refuse); (2) very acid and sandy (usually in central and north-central areas of the state) where repeated high amounts of potassium have been applied; or (3) calcareous organic soils. On sandy soils, magnesium deficiency is increased by high levels of available potassium (K) or ammonia-based nitrogen “ion antagonism.” This condition disappears after the ammonium is converted to nitrate by soil bacteria. A magnesium deficiency can be expected on sandy soils that test less than 50 ppm exchangeable magnesium and on silt loams or clay loams that test less than 100 ppm.

The most economical way to avoid a magnesium deficiency is to follow a good liming program with dolomitic limestone. A row application of 10 to 20 pounds of magnesium is recommended annually on magnesium-deficient soils where liming with dolomitic limestone is undesirable or where rapid correction is needed. Broadcast applications of magnesium are generally not recommended except when applying dolomitic lime. Additional information on magnesium is available in Extension publication *Soil and Applied Magnesium* (A2524).

**Sulfur.** Several research studies since 1968 have shown that sulfur (S) may be deficient in some parts of Wisconsin. Sulfur deficiencies are most likely to occur when high sulfur-demanding crops such as alfalfa, canola, or forage brassicas are grown on sandy soils or on other soils low in organic matter that are far from urbanized areas and have not received manure within the last 2 years.

The soil testing program estimates the sulfur available from all sources. “Available” sulfur includes sulfur in precipitation, sulfur released from soil organic matter, sulfur from applied manure, subsoil sulfur, and the sulfate ( $\text{SO}_4$ ) sulfur determined by soil analysis. These inputs are added together and reported on the Soil Test Report as the sulfur availability index (SAI). The following equation is used to calculate the index value and the assumptions for each input are described below:

|  |
|--|
| <p>Sulfur availability index (SAI) =</p> $\text{OM-S} + \text{manure-S} + \text{pptn-S} + \text{subsoil-S} + \text{test SO}_4\text{-S}$ <p>OM-S (sulfur in organic matter) =</p> $\% \text{ organic matter (OM)} \times 2.8 \text{ lb/a}$ <p>manure-S = tons of manure applied <math>\times</math> lb available S/ton</p> <p>pptn-S (sulfur in precipitation) = 10 or 20 lb/a (depending on county)</p> <p>subsoil-S = 5, 10, or 20 lb/a for low, medium, or high subsoil sulfur, respectively</p> <p>test <math>\text{SO}_4\text{-S}</math> = ppm S (from lab test) <math>\times</math> 2</p> |
|--|

The sulfur contributed by organic matter is estimated by assuming that soil organic matter contains 0.56% total sulfur and that 2.5% of this is made available annually. This translates to 2.8 lb/a of sulfur per 1% organic matter in the plow layer.

Sulfur in manure is based on the kind of animal and the rate applied. The program assumes that 55% of the sulfur will be available the first year after application, 10% will be available the second year, and 5% will be available the third year (table 23).



The amount of sulfur from precipitation is based on surveys performed by Hoelt and Walsh in 1972 and by Andraski and Bundy in 1990. These studies showed that western and northern Wisconsin receive approximately 10 lb sulfur/a annually; the rest of the state receives about twice as much. The soil testing program assigns 10 lb/a or 20 lb/a of sulfur depending on the county (table 13).

Some subsoils, especially those that are acidic and clayey, may contain enough sulfur for high-yielding crops even though the plow layer may test low. The subsoil sulfur estimates listed in table 10 are based on surveys of subsoil sulfur conducted in 1974, 1985, and 1989. The program adds 5 lb/a for low levels of subsoil sulfur, 10 lb/a for medium levels, and 20 lb/a for high levels. If you've had a profile sulfate-sulfur test performed (with a profile nitrate-nitrogen test, for example), you can use the results to adjust the reported sulfur availability index. To adjust the index, substitute the measured subsoil sulfur (converted to lb/a) for the estimated subsoil sulfur.

If the sulfur availability index is less than 30, sulfur should be added; if the index is between 30 and 40, confirm the need for sulfur using plant analysis as indicated by comment 2; and if it is greater than 40, no additional sulfur is recommended. A 5-ton/a (dry matter) alfalfa crop will remove about 30 lb sulfur/a. Allowing for 75% recovery of available sulfur, 40 lb/a is required for this crop.

If a sulfur deficiency is observed, or if low soil test sulfur is confirmed by plant analysis, the soil should be treated as shown in table 26.

If alfalfa will be grown on soils needing sulfur, either elemental sulfur or sulfate forms such as potassium sulfate, ammonium sulfate, potassium-magnesium sulfate, or calcium sulfate (gypsum) can be used. When applied at recommended rates, sulfate-sulfur will generally last for two or more years while elemental sulfur should last for

the term of the stand. Elemental sulfur converts to sulfate more rapidly when it is incorporated. Shallow-rooted crops on low-sulfur soils will generally benefit from annual applications of smaller amounts of sulfur. For annuals, incorporate elemental sulfur.

Additional information on sulfur is available in Extension publication *Soil and Applied Sulfur* (A2525).

### Micronutrients

Plants need only very small amounts of micronutrients for maximum growth. When present in the soil at excessive concentrations, micronutrients can harm plants. Thus, while a deficiency of any essential element will greatly reduce plant growth, the overuse of micronutrients can produce a harmful level of these nutrients in the soil which may be more difficult to correct than a deficiency. This is particularly true on coarse-textured soils such as sands, loamy sands, and sandy loams.

Micronutrients should be used when the soil test is low, when verified deficiency symptoms appear in the plant, or when certain crops have very high requirements, such as boron for beets. Currently, Wisconsin soil tests are available for boron, manganese, and zinc. The tests are interpreted in table 7. Soil tests for copper, iron, and molybdenum are not sufficiently calibrated for accurately predicting the supply of these nutrients in Wisconsin soils. Analysis of plant tissue is a more reliable diagnostic tool than soil testing for identifying micronutrient problems.

**Boron.** The interpretation of the soil test for boron (B) depends on the texture of the soil. Sandy soils do not hold boron as tightly as clayey soils. A "high" test in a sandy soil may be only "medium" in a silt loam. If a soil tests low or very low for boron and the crop requirement is high, apply 2 or 3 lb/a of boron, respectively; if the crop requirement is medium, apply 1 or 2 lb/a of boron. If the crop requirement is low and the soil tests very low for boron, confirm need using plant

analysis. Do not apply boron for any crop once the soil test reaches the "excessively high" range. For more information about boron, consult Extension publication *Soil and Applied Boron* (A2522).

**Manganese.** Manganese (Mn) deficiency is usually associated with neutral or calcareous mineral soils, with calcareous muck, and with organic soils that have been burned. Manganese deficiency is highly unlikely on soils that have a pH below 6.8. Manganese should be applied in the row for row crops or in the grain drill for small grains. Due to rapid soil fixation, broadcast manganese applications are not effective. Where crop manganese needs are high, band apply 5 lb manganese/a as sulfate or 0.8 lb manganese/a as chelate. Where the manganese requirement is medium apply 3 lb manganese/a as sulfate or 0.5 lb manganese/a as chelate. Foliar applications can also be used at 1 lb/a of manganese as sulfate or 0.15 lb/a manganese as chelate. Multiple foliar applications may be necessary. Additional information on manganese is available in Extension publication *Soil and Applied Manganese* (A2526).

**Zinc.** Scalped or severely eroded soils are more likely to be deficient in zinc (Zn) than well-managed soils. Zinc deficiencies are more common on sands, sandy loams, and organic soils because these soils originally contain low total zinc levels. Zinc availability decreases markedly as the soil pH increases; therefore, zinc deficiency usually is limited to soils with a pH above 6.5. Zinc deficiency has been observed in tree fruits and ornamentals in southern Wisconsin where irrigation with alkaline or hard water has resulted in high soil pH.

Zinc deficiencies may be corrected with either banded or broadcast applications of 2–4 lb/a of zinc in the band or 4–8 lb/a of zinc broadcast. If using a chelated form, apply 0.5–1.0 lb/a of zinc in the band or 1–2 lb/a broadcast. Deficiencies may also be corrected with

a foliar application by using 1.0 lb/a of zinc sulfate or 0.15 lb/a of zinc chelate. More than one foliar application may be required for severe deficiencies.

Additional information on zinc is available in Extension publication *Soil and Applied Zinc* (A2528).

**Copper.** Copper (Cu) deficiency is usually only seen on very acid soils, particularly mucks. Because copper is not easily leached from the soil, and it is not readily fixed in unavailable forms, repeated fertilization with copper is not necessary. It is unlikely that there is any benefit from additions of more than a total of 30 lb/a of copper to a soil over several years. In addition, some toxicities have been reported at high levels of use. Copper recommendations are listed in table 27.

**Molybdenum.** The availability of molybdenum (Mo) decreases as soil pH decreases. On soil with a pH below 5.5, crops with a high molybdenum requirement (e.g., broccoli and table beets) should be seed-treated with 0.2 ounces/a of molybdenum as ammonium or sodium molybdate. Foliar treatment with 0.8 ounces/a of molybdenum is an alternative treatment. Liming soils to optimal pH levels usually eliminates molybdenum problems.

**Iron.** Iron (Fe) deficiency has not been observed on any field or vegetable crops in Wisconsin. Turfgrass, pin oak trees, and some ornamentals such as yews have shown iron deficiency on soils with a pH greater than 7.5. This deficiency can be corrected by spraying the foliage with iron compounds such as ferrous sulfate or iron chelates or by decreasing soil pH.

**Chlorine.** Crops require only very small amounts of chlorine (Cl). Chlorine deficiency has never been observed in Wisconsin fields. This micronutrient is unlikely to become deficient in Wisconsin because it is often applied in fertilizer salts such as potassium chloride, is present in manure, and is a universal contaminant in dust and rainwater.

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**Table 1.** Analytical procedures for soil tests performed at University of Wisconsin-Extension laboratories and Wisconsin ASCS-approved private laboratories

| Soil test                                      | Procedures <sup>a</sup>   |
|--|---|
| Soil pH  | Prepare a 1:1.3 soil to water mixture and measure the pH with a glass electrode.  |
| Buffer pH (SMP)                                | Prepare a soil-SMP buffer mixture and measure the pH with a glass electrode.  |
| Phosphorus (P)                                 | Extract with Bray P <sub>1</sub> , develop color and measure with a photoelectric colorimeter.  |
| Potassium (K)                                  | Extract with Bray P <sub>1</sub> and measure with a flame photometer.   |
| Organic matter (OM)                            | Loss of weight on ignition at 360°C for 2 hours.<br>OM = 0.07 + 0.89 (LOI) <sup>b</sup>   |
| Calcium (Ca) and magnesium (Mg) or sodium (Na) | Extract with neutral 1N <sup>c</sup> ammonium acetate and measure with atomic absorption or flame photometer.   |
| Estimated cation exchange capacity (CEC)       | Calculate from soil test levels for Ca, Mg, K;<br>$\text{Est CEC} = \left( \frac{\text{ppm Ca}}{200} + \frac{\text{ppm Mg}}{122} + \frac{\text{ppm K}}{391} \right) \times \frac{5\text{g}}{\text{wt of soil in 5-gram scoop}}$ |
| Sulfur (S)                                     | Extract with 500 ppm phosphorus in acetic acid, develop turbidity, and measure with a photoelectric nephelometer.   |
| Boron (B)                                      | Extract with hot water, develop color, and measure with a photoelectric colorimeter.  |
| Manganese (Mn)                                 | Extract with 0.1N <sup>c</sup> phosphoric acid and measure by atomic absorption.  |
| Zinc (Zn)                                      | Extract with 0.1N <sup>c</sup> hydrochloric acid and measure by atomic absorption.  |
| Physical analysis (% sand, silt & clay)        | Prepare 50 or 100 g soil with dispersing solution and measure with hydrometer.  |
| Soluble salts                                  | Prepare 1:2 soil to water mixture and measure with conductivity bridge.   |

<sup>a</sup> Current UW fee schedules and detailed procedures are available from the Soil and Plant Analysis Laboratory, 5711 Mineral Point Road, Madison, WI 53705-4453.

<sup>b</sup> LOI = weight loss on ignition expressed as percent

<sup>c</sup> N = normal solution

**Table 2.** Codes and descriptions of soil test interpretation categories

| <b>Category</b>  |               |  | <b>Probability of yield increase<sup>a</sup> (%)</b> |
|------------------|---------------|--|--|
| <b>Name</b>      | <b>Symbol</b> | <b>Description</b>   |  |
| Very low         | VL            | Substantial quantities of nutrients are required to optimize crop yield. Buildup should occur over a 5- to 8-year period. Response to secondary or micronutrients is likely or possible for high or medium demanding crops, respectively.  | >90  |
| Low              | L             | Somewhat more nutrients than those removed by crop harvest are required. Response to secondary or micronutrients is possible for high demanding crops, but unlikely for medium or low demanding crops.   | 60–90  |
| Optimum          | Opt           | This is economically and environmentally the most desirable soil test category. Yields are optimized at nutrient additions approximately equal to amounts removed in the harvested portion of the crop. Response to secondary or micronutrients is unlikely regardless of crop demand level. | 30–60  |
| High             | H             | Some nutrients are required, and returns are optimized at rates equal to about one-half of nutrient removal by the crop.   | 5–30   |
| Very high        | VH            | Used only for potassium. Soil tests are above the optimum range and gradual draw-down is recommended. Approximately one-fourth of nutrient removal is recommended.   | ≈5   |
| Excessively high | EH            | No fertilizer is recommended for most soils since the soil test level will remain in the nonresponsive range for at least two to three years. On medium- and fine-textured soils, a small amount of starter fertilizer is advised for row crops.   | <2   |

<sup>a</sup> Percentage of fields that can be expected to show a profitable yield increase when recommended nutrients are applied.

**Table 3.** Approximate amounts of organic matter in various Wisconsin soils

| <b>Soil characteristics</b>                                       | <b>Approximate amount of organic matter in the plow layer (%)</b> |
|---|---|
| Light- and dark-colored sands and loamy sands                     | 0.4–1.2   |
| Light-colored sandy loams   | 1.2–2.0   |
| Dark-colored sandy loams and light-colored silt loam and loams    | 2.0–3.5   |
| Moderately dark and dark-colored silt loams, loams and clay loams | 3.5–6.0   |
| Imperfectly drained soils   | 6.0–10.0  |
| Poorly drained and very poorly drained soils                      | 10.0–20.0   |
| Peats and mucks   | >20   |

**Table 4.** Crop codes, optimum soil pH values and index to fertilizer recommendations for each crop

| Crop code | Crop name                     | Lime recommendation |         | P and K demand level | Tables for fertilizer recommendations |           |
|-----------|-------------------------------|---------------------|---------|----------------------|---------------------------------------|-----------|
|           |                               | Mineral             | Organic |                      | N                                     | P and K   |
| 1         | Alfalfa                       | 6.8                 | —       | 3                    | 22                                    | 16 and 19 |
| 2         | Alfalfa seeding               | 6.8                 | —       | 3                    | 22                                    | 17 and 19 |
| 3         | Asparagus                     | 6.0                 | 5.6     | 5                    | 22                                    | 18 and 19 |
| 4         | Barley                        | 6.6                 | 5.6     | 4                    | 22                                    | 17 and 19 |
| 5         | Bean, dry (kidney, navy)      | 6.0                 | 5.6     | 3                    | 22                                    | 18 and 19 |
| 6         | Bean, lima                    | 6.0                 | 5.6     | 3                    | 22                                    | 18 and 19 |
| 7         | Beet, table                   | 6.0                 | 5.6     | 5                    | 22                                    | 18 and 19 |
| 8         | Brassica, forage              | 6.0                 | 5.6     | 3                    | 22                                    | 17 and 19 |
| 9         | Broccoli                      | 6.0                 | 5.6     | 5                    | 22                                    | 18 and 19 |
| 10        | Brussels sprout               | 6.0                 | 5.6     | 5                    | 22                                    | 18 and 19 |
| 11        | Buckwheat                     | 5.6                 | 5.4     | 2                    | 22                                    | 17 and 19 |
| 12        | Cabbage                       | 6.0                 | 5.6     | 5                    | 22                                    | 18 and 19 |
| 13        | Canola                        | 5.8                 | 5.6     | 1                    | 22                                    | 17 and 19 |
| 14        | Carrot                        | 5.8                 | 5.6     | 5                    | 22                                    | 18 and 19 |
| 15        | Cauliflower                   | 6.0                 | 5.6     | 5                    | 22                                    | 18 and 19 |
| 16        | Celery                        | 6.0                 | 5.6     | 5                    | 22                                    | 18 and 19 |
| 17        | Corn, grain                   | 6.0                 | 5.6     | 1                    | 20                                    | 14 and 19 |
| 18        | Corn, silage                  | 6.0                 | 5.6     | 1                    | 20                                    | 17 and 19 |
| 19        | Corn, sweet                   | 6.0                 | 5.6     | 3                    | 22                                    | 18 and 19 |
| 20        | Cucumber                      | 5.8                 | 5.6     | 5                    | 22                                    | 18 and 19 |
| 21        | Flax                          | 6.0                 | 5.6     | 2                    | 22                                    | 17 and 19 |
| 22        | Ginseng                       | —                   | —       | 5                    | 22                                    | 18 and 19 |
| 23        | Lettuce                       | 5.8                 | 5.6     | 5                    | 22                                    | 18 and 19 |
| 24        | Lupin                         | 6.3                 | 5.6     | 4                    | 22                                    | 17 and 19 |
| 25        | Melon                         | 5.8                 | 5.6     | 5                    | 22                                    | 18 and 19 |
| 26        | Millet                        | 5.6                 | 5.4     | 2                    | 22                                    | 17 and 19 |
| 27        | Mint, oil                     | —                   | 5.6     | 5                    | 22                                    | 18 and 19 |
| 28        | Oat                           | 5.8                 | 5.6     | 4                    | 22                                    | 17 and 19 |
| 29        | Oatlage <sup>b</sup>          | 6.8                 | —       | 4                    | 22                                    | 17 and 19 |
| 30        | Oat-pea forage <sup>b</sup>   | 6.8                 | —       | 4                    | 22                                    | 17 and 19 |
| 31        | Onion                         | 5.6                 | 5.4     | 5                    | 22                                    | 18 and 19 |
| 32        | Pasture, unimproved           | 6.0                 | 5.6     | 2                    | 22                                    | 17 and 19 |
| 33        | Pasture, managed <sup>c</sup> | 6.0                 | 5.6     | 1                    | 22                                    | 17 and 19 |
| 34        | Pasture, legume-grass         | 6.0                 | —       | 4                    | 22                                    | 17 and 19 |
| 35        | Pea, canning                  | 6.0                 | 5.6     | 3                    | 22                                    | 18 and 19 |
| 36        | Pea (chick, field, cow)       | 6.0                 | 5.6     | 3                    | 22                                    | 17 and 19 |
| 37        | Pepper                        | 6.0                 | 5.6     | 5                    | 22                                    | 18 and 19 |
| 38        | Popcorn                       | 6.0                 | 5.6     | 3                    | 22                                    | 18 and 19 |
| 39        | Potato                        | 5.2/6.0             | 5.2/5.6 | 6                    | 21                                    | 18 and 19 |
| 40        | Pumpkin                       | 6.0                 | 5.6     | 5                    | 22                                    | 18 and 19 |
| 41        | Reed canarygrass              | 6.0                 | 5.6     | 2                    | 22                                    | 17 and 19 |
| 42        | Red clover                    | 6.3                 | 5.6     | 4                    | 22                                    | 16 and 19 |
| 43        | Rye                           | 5.6                 | 5.4     | 4                    | 22                                    | 17 and 19 |
| 44        | Snapbean                      | 6.8                 | 5.6     | 3                    | 22                                    | 18 and 19 |
| 45        | Sod                           | 6.0                 | 5.6     | 2                    | 22                                    | 17 and 19 |

<sup>a</sup>Lime recommendations for apples and cherries apply only to pre-plant tests. Adjustment of pH is impractical once an orchard is established. Print comment 41 if these crop codes selected.

(continued)

<sup>b</sup>Assumes alfalfa underseeding.

<sup>c</sup>Includes brome grass, fescue, orchard grass, ryegrass, and timothy.



**Table 4.** (continued)

| Crop<br>code | Crop name            | Lime recommendation<br>Target pH |         | P and K<br>demand<br>level | Tables for fertilizer<br>recommendations |           |
|--------------|----------------------|----------------------------------|---------|----------------------------|--|-----------|
|              |                      | Mineral                          | Organic |                            | N  | P and K   |
| 46           | Sorghum, grain       | 5.6                              | 5.4     | 2                          | 22                                       | 17 and 19 |
| 47           | Sorghum-sudan forage | 5.6                              | 5.4     | 2                          | 22                                       | 17 and 19 |
| 48           | Soybean              | 6.3                              | 5.6     | 2                          | 22                                       | 15 and 19 |
| 49           | Spinach              | 6.0                              | 5.6     | 5                          | 22                                       | 18 and 19 |
| 50           | Squash               | 6.0                              | 5.6     | 5                          | 22                                       | 18 and 19 |
| 51           | Sunflower            | 6.0                              | 5.6     | 1                          | 22                                       | 17 and 19 |
| 52           | Tobacco              | 5.8                              | 5.6     | 5                          | 22                                       | 17 and 19 |
| 53           | Tomato               | 6.0                              | 5.6     | 5                          | 22                                       | 18 and 19 |
| 54           | Trefoil, birdsfoot   | 6.0                              | 5.6     | 4                          | 22                                       | 16 and 19 |
| 55           | Triticale            | 6.0                              | 5.6     | 4                          | 22                                       | 17 and 19 |
| 56           | Truck crops          | 6.0                              | 5.6     | 5                          | 22                                       | 18 and 19 |
| 57           | Vetch (crown, hairy) | 6.0                              | 5.6     | 4                          | 22                                       | 17 and 19 |
| 58           | Wheat                | 6.0                              | 5.6     | 3                          | 22                                       | 17 and 19 |
| 59           | Miscellaneous        | —                                | —       | —                          | —  | —         |
| 60           | Apple <sup>a</sup>   | 6.0                              | —       | 3                          | 22                                       | 18 and 19 |
| 61           | Blueberry            | 4.5                              | 4.5     | 3                          | 22                                       | 18 and 19 |
| 62           | Cherry <sup>a</sup>  | 6.0                              | —       | 3                          | 22                                       | 18 and 19 |
| 63           | Cranberry            | 4.5                              | 4.5     | 3                          | 22                                       | 18 and 19 |
| 64           | Raspberry            | 6.0                              | 5.6     | 3                          | 22                                       | 18 and 19 |
| 65           | Strawberry           | 6.0                              | 5.6     | 3                          | 22                                       | 18 and 19 |
| 66           | CRP, alfalfa         | 6.6                              | —       | 3                          | 22                                       | 17 and 19 |
| 67           | CRP, red clover      | 6.3                              | 5.6     | 4                          | 22                                       | 17 and 19 |
| 68           | CRP, grass           | 5.6                              | 5.4     | 2                          | 22                                       | 17 and 19 |

<sup>a</sup>Lime recommendations for apples and cherries apply only to pre-plant tests. Adjustment of pH is impractical once an orchard is established. Print comment 41 if these crop codes selected.

<sup>b</sup>Assumes alfalfa underseeding.

<sup>c</sup>Includes brome grass, fescue, orchard grass, ryegrass, and timothy.

**Table 5.** Soil test interpretation ranges for phosphorus.

| Subsoil fert.<br>group   | Soil test category |            |                  |             |                          |
|--|--------------------|------------|------------------|-------------|--------------------------|
|  | Very low<br>(VL)   | Low<br>(L) | Optimum<br>(Opt) | High<br>(H) | Excessively<br>high (EH) |
| soil test P, ppm <sup>a</sup>  |                    |            |                  |             |                          |
| <b>Demand level 1 (corn)</b>   |                    |            |                  |             |                          |
| A  | <5                 | 5–10       | 11–15            | 16–25       | >25                      |
| B  | <10                | 10–15      | 16–20            | 21–30       | >30                      |
| C  | <10                | 10–15      | 16–20            | 21–30       | >30                      |
| D  | <8                 | 8–12       | 13–18            | 19–28       | >28                      |
| E  | <12                | 12–22      | 23–32            | 33–42       | >42                      |
| O  | <12                | 12–22      | 23–32            | 33–42       | >42                      |
| X  | <5                 | 5–8        | 9–15             | 16–25       | >25                      |
| <b>Demand level 2 (soybeans and low-demand field crops)</b>                            |                    |            |                  |             |                          |
| A  | —                  | <6         | 6–10             | 11–20       | >20                      |
| B  | —                  | <6         | 6–10             | 11–20       | >20                      |
| C  | —                  | <8         | 8–13             | 14–23       | >23                      |
| D  | —                  | <6         | 6–10             | 11–20       | >20                      |
| E  | —                  | <10        | 10–15            | 16–25       | >25                      |
| O  | —                  | <10        | 10–15            | 16–25       | >25                      |
| X  | —                  | <6         | 6–10             | 11–17       | >17                      |
| <b>Demand level 3 (alfalfa, irrigated field crops, and low-demand vegetable crops)</b> |                    |            |                  |             |                          |
| A  | <10                | 10–15      | 16–23            | 24–32       | >32                      |
| B  | <10                | 10–17      | 18–23            | 24–30       | >30                      |
| C  | <12                | 12–17      | 18–25            | 26–35       | >35                      |
| D  | <10                | 10–15      | 16–23            | 24–30       | >30                      |
| E  | <18                | 18–25      | 26–37            | 38–55       | >55                      |
| O  | <18                | 18–25      | 26–37            | 38–55       | >55                      |
| X  | <5                 | 5–10       | 11–15            | 16–23       | >23                      |
| <b>Demand level 4 (red clover and medium-demand field crops)</b>                       |                    |            |                  |             |                          |
| A  | <10                | 10–15      | 16–20            | 21–25       | >25                      |
| B  | <10                | 10–15      | 16–20            | 21–25       | >25                      |
| C  | <12                | 12–17      | 18–23            | 24–30       | >30                      |
| D  | <8                 | 8–12       | 13–18            | 19–23       | >23                      |
| E  | <15                | 15–22      | 23–30            | 31–38       | >38                      |
| O  | <15                | 15–22      | 23–30            | 31–38       | >38                      |
| X  | <5                 | 5–10       | 11–15            | 16–20       | >20                      |
| <b>Demand level 5 (high-demand vegetable crops)</b>                                    |                    |            |                  |             |                          |
| A  | <15                | 15–30      | 31–45            | 46–75       | >75                      |
| B  | <15                | 15–30      | 31–45            | 46–75       | >75                      |
| C  | <15                | 15–30      | 31–45            | 46–75       | >75                      |
| D  | <15                | 15–30      | 31–45            | 46–75       | >75                      |
| E  | <18                | 18–35      | 36–50            | 51–80       | >80                      |
| O  | <18                | 18–35      | 36–50            | 51–80       | >80                      |
| X  | <10                | 10–25      | 26–40            | 41–60       | >60                      |
| <b>Demand level 6 (potato)</b>   |                    |            |                  |             |                          |
| A  | <100               | 100–160    | 161–200          | >200        | —                        |
| B  | <100               | 100–160    | 161–200          | >200        | —                        |
| C  | <100               | 100–160    | 161–200          | >200        | —                        |
| D  | <100               | 100–160    | 161–200          | >200        | —                        |
| E  | <60                | 60–90      | 91–125           | 126–160     | >160                     |
| O  | <60                | 60–90      | 91–125           | 126–160     | >160                     |
| X  | <36                | 36–60      | 61–75            | 76–120      | >120                     |

<sup>a</sup>ppm (wt/vol; g/m<sup>3</sup>)

**Table 6.** Soil test interpretation ranges for potassium.

| Subsoil fert.<br>group   | Very low<br>(VL) | Soil test category |                  |             |         | Very high<br>(H) | Excessively<br>high (EH) |
|--|------------------|--------------------|------------------|-------------|---------|------------------|--------------------------|
|  |                  | Low<br>(L)         | Optimum<br>(Opt) | High<br>(H) |         |                  |                          |
| soil test K, ppm <sup>a</sup>  |                  |                    |                  |             |         |                  |                          |
| Demand level 1 (corn)  |                  |                    |                  |             |         |                  |                          |
| A  | <60              | 60–80              | 81–100           | 101–140     | —       | >140             |                          |
| B  | <70              | 70–90              | 91–110           | 111–150     | —       | >150             |                          |
| C  | <60              | 60–70              | 71–100           | 101–140     | —       | >140             |                          |
| D  | <70              | 70–100             | 101–130          | 131–160     | —       | >160             |                          |
| E  | <45              | 45–65              | 66–90            | 91–130      | —       | >130             |                          |
| O  | <45              | 45–65              | 66–90            | 91–130      | —       | >130             |                          |
| Demand level 2 (soybeans and low-demand field crops)                           |                  |                    |                  |             |         |                  |                          |
| A  | <50              | 50–80              | 81–100           | 101–120     | 121–140 | >140             |                          |
| B  | <50              | 50–80              | 81–100           | 101–120     | 121–140 | >140             |                          |
| C  | <40              | 40–70              | 71–90            | 91–110      | 111–130 | >130             |                          |
| D  | <70              | 70–100             | 101–120          | 121–140     | 141–160 | >160             |                          |
| E  | —                | <60                | 60–80            | 81–100      | 101–120 | >120             |                          |
| O  | —                | <60                | 60–80            | 81–100      | 101–120 | >120             |                          |
| Demand level 3 (alfalfa, irrigated field crops and low-demand vegetable crops) |                  |                    |                  |             |         |                  |                          |
| A  | <70              | 70–90              | 91–120           | 121–150     | 151–170 | >170             |                          |
| B  | <70              | 70–90              | 91–120           | 121–150     | 151–170 | >170             |                          |
| C  | <55              | 55–70              | 71–100           | 101–130     | 131–150 | >150             |                          |
| D  | <90              | 90–110             | 111–140          | 141–170     | 171–200 | >200             |                          |
| E  | <50              | 50–80              | 81–120           | 121–160     | 161–180 | >180             |                          |
| O  | <50              | 50–80              | 81–120           | 121–160     | 161–180 | >180             |                          |
| Demand level 4 (red clover and medium-demand field crops)                      |                  |                    |                  |             |         |                  |                          |
| A  | <55              | 55–70              | 71–100           | 101–120     | 121–150 | >150             |                          |
| B  | <55              | 55–70              | 71–100           | 101–120     | 121–150 | >150             |                          |
| C  | <50              | 50–65              | 66–90            | 91–110      | 111–130 | >130             |                          |
| D  | <60              | 60–80              | 81–120           | 121–140     | 141–160 | >160             |                          |
| E  | <45              | 45–60              | 61–90            | 91–110      | 111–130 | >130             |                          |
| O  | <45              | 45–60              | 61–90            | 91–110      | 111–130 | >130             |                          |
| Demand level 5 (high-demand vegetable crops)                                   |                  |                    |                  |             |         |                  |                          |
| A  | <60              | 60–120             | 121–180          | 181–200     | 201–220 | >220             |                          |
| B  | <60              | 60–120             | 121–180          | 181–200     | 201–220 | >220             |                          |
| C  | <50              | 50–110             | 111–160          | 161–180     | 181–200 | >200             |                          |
| D  | <80              | 80–140             | 141–200          | 201–220     | 221–240 | >240             |                          |
| E  | <50              | 50–100             | 101–150          | 151–165     | 166–180 | >180             |                          |
| O  | <50              | 50–100             | 101–150          | 151–165     | 166–180 | >180             |                          |
| Demand level 6 (potato)  |                  |                    |                  |             |         |                  |                          |
| A  | <80              | 80–120             | 121–160          | 161–180     | 181–210 | >210             |                          |
| B  | <80              | 80–120             | 121–160          | 161–180     | 181–210 | >210             |                          |
| C  | <70              | 70–100             | 101–150          | 151–170     | 171–190 | >190             |                          |
| D  | <80              | 80–120             | 121–170          | 171–190     | 191–220 | >220             |                          |
| E  | <70              | 70–100             | 101–130          | 131–160     | 161–190 | >190             |                          |
| O  | <70              | 70–100             | 101–130          | 131–160     | 161–190 | >190             |                          |

<sup>a</sup>ppm (wt/vol; gm/m<sup>3</sup>)

**Table 7.** Interpretation of soil test values for secondary nutrients and micronutrients

| Element             | Soil texture code <sup>a</sup> | Soil test category |         |               |          |                       |
|---------------------|--------------------------------|--------------------|---------|---------------|----------|-----------------------|
|                     |                                | Very low (VL)      | Low (L) | Optimum (Opt) | High (H) | Excessively high (EH) |
|                     |                                |                    |         |               |          |                       |
| Calcium             | 1                              | 0–200              | 201–400 | 401–600       | >600     | —                     |
|                     | 2,3,4                          | 0–300              | 301–600 | 601–1000      | >1000    | —                     |
| Magnesium           | 1                              | 0–25               | 26–50   | 51–250        | >250     | —                     |
|                     | 2,3,4                          | 0–50               | 51–100  | 101–500       | >500     | —                     |
| Boron               | 1                              | 0–0.2              | 0.3–0.4 | 0.5–1.0       | 1.1–2.5  | >2.5                  |
|                     | 2,4                            | 0–0.3              | 0.4–0.8 | 0.9–1.5       | 1.6–3.0  | >3.0                  |
|                     | 3                              | 0–0.5              | 0.6–1.0 | 1.1–2.0       | 2.1–4.0  | >4.0                  |
| Zinc                | 1,2,3,4                        | 0–1.5              | 1.6–3.0 | 3.1–20        | 21–40    | >40                   |
| Manganese           |                                |                    |         |               |          |                       |
| O.M. less than 6.1% | 1,2,3,4                        | —                  | 0–10    | 11–20         | >20      | —                     |
|                     |                                |                    |         | Soil pH       |          |                       |
| O.M. more than 6.0% | 1,2,3,4                        | —                  | >6.9    | 6.0–6.9       | <6.0     | —                     |
| SAI <sup>b</sup>    |                                |                    |         |               |          |                       |
| Sulfur              | 1,2,3,4                        | —                  | <30     | 30–40         | >40      | —                     |

<sup>a</sup>Soil texture codes: 1 = sandy soils; 2 = loams, silts, and clays; 3 = organic soils; 4 = red soils.

<sup>b</sup>Sulfur availability index (SAI) includes estimates of sulfur released from organic matter, sulfur in precipitation, subsoil sulfur and sulfur in manure if applied, as well as sulfate sulfur (SO<sub>4</sub>-S) determined by soil test.

**Table 8.** Relative micronutrient requirements of Wisconsin crops

| Crop code | Crop                     | Micronutrient <sup>a</sup> |        |           |            |        |
|-----------|--------------------------|----------------------------|--------|-----------|------------|--------|
|           |                          | Boron                      | Copper | Manganese | Molybdenum | Zinc   |
| 1         | Alfalfa                  | High                       | Medium | Low       | Medium     | Low    |
| 2         | Alfalfa seeding          | High                       | Medium | Low       | Medium     | Low    |
| 3         | Asparagus                | Medium                     | Low    | Low       | Low        | Low    |
| 4         | Barley                   | Low                        | Medium | Medium    | Low        | Medium |
| 5         | Bean, dry (kidney, navy) | Low                        | Low    | High      | Medium     | Medium |
| 6         | Bean, lima               | Low                        | Low    | High      | Medium     | Medium |
| 7         | Beet                     | High                       | High   | Medium    | High       | Medium |
| 8         | Brassica, forage         | High                       | —      | —         | High       | —      |
| 9         | Broccoli                 | Medium                     | Medium | Medium    | High       | —      |
| 10        | Brussels sprout          | Medium                     | Medium | Medium    | High       | —      |
| 11        | Buckwheat                | Low                        | —      | —         | —          | —      |
| 12        | Cabbage                  | Medium                     | Medium | Medium    | Medium     | Low    |
| 13        | Canola                   | High                       | Medium | Medium    | Medium     | Medium |
| 14        | Carrot                   | Medium                     | Medium | Medium    | Low        | Low    |
| 15        | Cauliflower              | High                       | Medium | Medium    | High       | —      |
| 16        | Celery                   | High                       | Medium | Medium    | Low        | —      |
| 17        | Corn, grain              | Low                        | Medium | Medium    | Low        | High   |
| 18        | Corn, silage             | Low                        | Medium | Medium    | Low        | High   |
| 19        | Corn, sweet              | Low                        | Medium | Medium    | Low        | High   |
| 20        | Cucumber                 | Low                        | Medium | Medium    | Low        | Medium |
| 21        | Flax                     | —                          | —      | —         | —          | —      |
| 22        | Ginseng                  | —                          | —      | —         | —          | —      |
| 23        | Lettuce                  | Medium                     | High   | High      | High       | Medium |
| 24        | Lupin                    | Low                        | Low    | Low       | Medium     | Medium |
| 25        | Melon                    | Medium                     | —      | —         | —          | —      |
| 26        | Millet                   | Low                        | —      | —         | —          | —      |
| 27        | Mint, oil                | Low                        | Low    | Medium    | Low        | Low    |
| 28        | Oat                      | Low                        | Medium | High      | Low        | Low    |
| 29        | Oatlage                  | Low                        | Medium | High      | Low        | Low    |
| 30        | Oat-pea forage           | Low                        | Medium | High      | Low        | Low    |
| 31        | Onion                    | Low                        | High   | High      | High       | High   |
| 32        | Pasture, unimproved      | Low                        | Low    | Medium    | Low        | Low    |
| 33        | Pasture, managed         | Low                        | Low    | Medium    | Low        | Low    |
| 34        | Pasture, legume-grass    | High                       | Medium | Low       | High       | Low    |
| 35        | Pea, canning             | Low                        | Low    | Medium    | Medium     | Low    |
| 36        | Pea (chick, field, cow)  | Low                        | Low    | Medium    | Medium     | Low    |
| 37        | Pepper                   | —                          | —      | —         | —          | —      |
| 38        | Popcorn                  | —                          | —      | —         | —          | —      |
| 39        | Potato                   | Low                        | Low    | Medium    | Low        | Medium |
| 40        | Pumpkin                  | —                          | —      | —         | —          | —      |
| 41        | Reed canarygrass         | Low                        | Low    | Medium    | Low        | Low    |
| 42        | Red clover               | Medium                     | Medium | Low       | Medium     | Low    |
| 43        | Rye                      | Low                        | Low    | Low       | Low        | Low    |
| 44        | Snapbean                 | Low                        | Low    | —         | —          | —      |
| 45        | Sod                      | Low                        | Low    | Medium    | Low        | Low    |
| 46        | Sorghum, grain           | Low                        | Medium | High      | Low        | High   |
| 47        | Sorghum-sudan forage     | Low                        | Medium | High      | Low        | Medium |
| 48        | Soybean                  | Low                        | Low    | High      | Medium     | Medium |
| 49        | Spinach                  | Medium                     | High   | High      | High       | High   |
| 50        | Squash                   | —                          | —      | —         | —          | —      |

**Table 8.** (continued)

| Crop<br>code | Crop                 | Micronutrient <sup>a</sup> |        |           |            |        |
|--------------|----------------------|----------------------------|--------|-----------|------------|--------|
|              |                      | Boron                      | Copper | Manganese | Molybdenum | Zinc   |
| 51           | Sunflower            | High                       | High   | —         | —          | —      |
| 52           | Tobacco              | Medium                     | Low    | Medium    | —          | Medium |
| 53           | Tomato               | High                       | High   | Medium    | Medium     | Medium |
| 54           | Trefoil, birdsfoot   | High                       | —      | —         | —          | —      |
| 55           | Triticale            | Low                        | Low    | Medium    | —          | —      |
| 56           | Truck crops          | Medium                     | Medium | —         | —          | —      |
| 57           | Vetch (crown, hairy) | Medium                     | —      | —         | —          | —      |
| 58           | Wheat                | Low                        | Medium | High      | Low        | Low    |
| 66           | CRP, alfalfa         | High                       | Medium | Low       | Medium     | Low    |
| 67           | CRP, red clover      | Medium                     | Medium | Low       | Medium     | Low    |
| 68           | CRP, grass           | Low                        | Low    | Medium    | Low        | Low    |

— = no data

<sup>a</sup>Iron (Fe) and chloride (Cl) deficiencies have not been noted on field crops in Wisconsin.



**Table 9.** Equations used to calculate lime requirements (LR) at various target pH levels.

| Target pH | Lime requirement (LR) formula (tons of 60-69 lime per acre) |
|-----------|---|
| 5.2       | $LR = 1.5 [0.873 (5.2 - pH)(OM^a - 0.07) + 0.0489 (SMP^b)]$ |
| 5.4       | $LR = 1.5 [1.13 (5.4 - pH) (OM - 0.07) + 0.049 (SMP)]$      |
| 5.6       | $LR = 1.5 [1.13 (5.6 - pH) (OM - 0.07) + 0.028 (SMP)]$      |
| 5.8       | $LR = 1.75 [1.16 (5.8 - pH) (OM - 0.07) + 0.050 (SMP)]$     |
| 6.0       | $LR = 1.75 [1.24 (6.0 - pH) (OM - 0.07) + 0.044 (SMP)]$     |
| 6.3       | $LR = 1.75 [1.35 (6.3 - pH) (OM - 0.07) + 0.030 (SMP)]$     |
| 6.5       | $LR = 2.0 [1.45 (6.5 - pH) (OM - 0.07) + 0.0150 (SMP)]$     |
| 6.6       | $LR = 2.0 [1.49 (6.6 - pH) (OM - 0.07) + 0.0015 (SMP)]$     |
| 6.8       | $LR = 2.0 [1.64 (6.8 - pH) (OM - 0.07) - 0.046 (SMP)]$      |

<sup>a</sup>OM = organic matter as determined by loss of weight by ignition expressed as a percentage.

<sup>b</sup>SMP = SMP buffer pH.

**Table 10.** Codes assigned to Wisconsin soils for subsoil group, subsoil sulfur, and corn and alfalfa yield potentials.

| Soil no. | Soil name                 | Subsoil group code <sup>a</sup> | Subsoil sulfur code <sup>b</sup> | Yield potential code <sup>c</sup> |         | Soil no. | Soil name              | Subsoil group code <sup>a</sup> | Subsoil sulfur code <sup>b</sup> | Yield potential code <sup>c</sup> |         |
|----------|---------------------------|---------------------------------|----------------------------------|-----------------------------------|---------|----------|------------------------|---------------------------------|----------------------------------|-----------------------------------|---------|
|          |                           |                                 |                                  | Corn                              | Alfalfa |          |                        |                                 |                                  | Corn                              | Alfalfa |
| 1        | Abbaye                    | D                               | L                                | 4                                 | 4       | 48       | Basco                  | B                               | M                                | 3                                 | 3       |
| 2        | Absco                     | E                               | L                                | 4                                 | 4       | 49       | Batavia                | B                               | M                                | 1                                 | 1       |
| 3        | Abscota                   | E                               | L                                | 4                                 | 4       | 50       | Bearpen                | A                               | M                                | 1                                 | 1       |
| 4        | Ackmore                   | A                               | H                                | 1                                 | 2       | 51       | Beauprey               | C                               | M                                | 3                                 | 4       |
| 5        | Adder                     | O                               | H                                | 2                                 | 4       | 52       | Beecher                | B                               | M                                | 1                                 | 2       |
| 6        | Adolph                    | D                               | L                                | 4                                 | 4       | 53       | Bellechester           | E                               | L                                | 4                                 | 4       |
| 7        | Adrian                    | O                               | H                                | 2                                 | 4       | 54       | Belleville             | B                               | M                                | 3                                 | 4       |
| 8        | Aftad                     | D                               | M                                | 3                                 | 3       | 55       | Bellevue               | B                               | M                                | 2                                 | 2       |
| 9        | Ahmeek                    | D                               | H                                | 4                                 | 3       | 56       | Bergland               | C                               | M                                | 4                                 | 4       |
| 10       | Akan                      | A                               | M                                | 3                                 | 3       | 57       | Bertrand               | A                               | M                                | 1                                 | 1       |
| 11       | Alban                     | D                               | M                                | 3                                 | 3       | 58       | Beseman                | O                               | H                                | 4                                 | 4       |
| 12       | Alcona                    | D                               | M                                | 3                                 | 3       |          | Bevent (See Sultz)     |                                 |                                  |                                   |         |
| 13       | Aldo                      | E                               | L                                | 4                                 | 4       | 59       | Billett                | A                               | M                                | 3                                 | 3       |
| 14       | Algansee                  | E                               | L                                | 4                                 | 4       | 60       | Billyboy               | D                               | M                                | 3                                 | 2       |
| 15       | Allendale                 | D                               | M                                | 4                                 | 4       | 61       | Bilmod                 | A                               | M                                | 3                                 | 3       |
|          | Allouez (See Elderon)     |                                 |                                  |                                   |         | 62       | Bilson                 | A                               | M                                | 3                                 | 3       |
| 16       | Almena                    | D                               | H                                | 3                                 | 2       | 63       | Bjorkland              | D                               | M                                | 4                                 | 4       |
| 17       | Alpena                    | E                               | L                                | 4                                 | 4       | 64       | Blackriver             | D                               | M                                | 2                                 | 2       |
| 18       | Alstad                    | D                               | M                                | 3                                 | 3       |          | Blomford (See Brevort) |                                 |                                  |                                   |         |
| 19       | Altdorf                   | D                               | M                                | 3                                 | 4       | 65       | Blount                 | A                               | M                                | 2                                 | 2       |
|          | Altoona (See Sioux creek) |                                 |                                  |                                   |         | 66       | Bluffton               | D                               | M                                | 3                                 | 3       |
| 20       | Amery                     | D                               | M                                | 3                                 | 3       | 67       | Boaz                   | A                               | M                                | 2                                 | 2       |
| 21       | Amnicon                   | C                               | M                                | 4                                 | 2       | 68       | Boguscreek             | B                               | M                                | 1                                 | 1       |
| 22       | Angelica                  | D                               | M                                | 3                                 | 3       | 69       | Bohemian               | D                               | M                                | 4                                 | 3       |
| 23       | Anigon                    | D                               | M                                | 3                                 | 2       | 70       | Bonduel                | D                               | M                                | 3                                 | 3       |
| 24       | Ankeny                    | B                               | L                                | 2                                 | 2       | 71       | Boone                  | E                               | L                                | 4                                 | 4       |
| 25       | Annalake                  | D                               | M                                | 3                                 | 3       | 72       | Boots                  | O                               | H                                | 2                                 | 4       |
| 26       | Antigo                    | D                               | M                                | 3                                 | 2       | 73       | Boplain                | E                               | L                                | 4                                 | 4       |
| 27       | Anton                     | C                               | M                                | 4                                 | 2       | 74       | Borea                  | C                               | M                                | 4                                 | 3       |
| 28       | Arbutus                   | E                               | L                                | 4                                 | 4       | 75       | Borth                  | C                               | M                                | 3                                 | 2       |
| 29       | Arenzville                | A                               | L                                | 1                                 | 1       | 76       | Boyer                  | A                               | M                                | 3                                 | 4       |
| 30       | Argonne                   | D                               | M                                | 4                                 | 3       |          | Braham (See Menominee) |                                 |                                  |                                   |         |
| 31       | Arland                    | D                               | M                                | 3                                 | 3       | 77       | Brander                | D                               | M                                | 3                                 | 2       |
| 32       | Arnheim                   | E                               | L                                | 4                                 | 4       | 78       | Branstad               | D                               | M                                | 3                                 | 2       |
| 33       | Ashdale                   | B                               | H                                | 1                                 | 1       | 79       | Brems                  | E                               | M                                | 4                                 | 4       |
| 34       | Ashippun                  | B                               | L                                | 1                                 | 2       | 80       | Brevort                | D                               | M                                | 3                                 | 3       |
| 35       | Ashkum                    | B                               | M                                | 1                                 | 3       | 81       | Brice                  | E                               | L                                | 4                                 | 4       |
| 36       | Ashwabay                  | C                               | M                                | 4                                 | 4       | 82       | Brickton               | D                               | M                                | 3                                 | 3       |
| 37       | Atterberry                | A                               | M                                | 1                                 | 2       | 83       | Briggsville            | A                               | M                                | 2                                 | 1       |
| 38       | Au Gres                   | E                               | L                                | 4                                 | 3       | 84       | Brill                  | D                               | M                                | 3                                 | 2       |
| 39       | Auburndale                | D                               | M                                | 3                                 | 3       | 85       | Brimley                | D                               | M                                | 4                                 | 3       |
| 40       | Augwood                   | E                               | L                                | 4                                 | 4       | 86       | Brodale                | B                               | L                                | 3                                 | 3       |
| 41       | Aztalan                   | B                               | M                                | 1                                 | 2       |          | Brokaw (See Santiago)  |                                 |                                  |                                   |         |
| 42       | Bach                      | D                               | M                                | 3                                 | 3       | 87       | Brookston              | B                               | M                                | 1                                 | 3       |
| 43       | Badriver                  | C                               | M                                | 4                                 | 3       |          | Brophy (See Greenwood) |                                 |                                  |                                   |         |
| 44       | Banat                     | E                               | L                                | 4                                 | 4       | 88       | Brownstone             | E                               | L                                | 4                                 | 4       |
| 45       | Baraboo                   | A                               | M                                | 2                                 | 3       | 89       | Bruce                  | D                               | M                                | 4                                 | 4       |
|          | Barrington (See Zurich)   |                                 |                                  |                                   |         | 90       | Burkhardt              | E                               | M                                | 4                                 | 4       |
| 46       | Barronett                 | D                               | M                                | 3                                 | 3       | 91       | Bushville              | D                               | M                                | 4                                 | 3       |
| 47       | Barry                     | B                               | M                                | 2                                 | 3       | 92       | Cable                  | D                               | M                                | 4                                 | 4       |

<sup>a</sup> Description of subsoil groups are given in table 11. <sup>b</sup> Subsoil sulfur code: L = 5 lb/a; M = 10 lb/a; H = 20 lb/a.<sup>c</sup> Yield potential code: 1 = very high; 2 = high; 3 = medium; 4 = low.

(continued)

Table 10. (continued)

| Soil no. | Soil name              | Subsoil group code <sup>a</sup> | Subsoil sulfur code <sup>b</sup> | Yield potential code <sup>c</sup> |         |
|----------|------------------------|---------------------------------|----------------------------------|-----------------------------------|---------|
|          |                        |                                 |                                  | Corn                              | Alfalfa |
| 93       | Cadiz                  | A                               | M                                | 2                                 | 1       |
| 94       | Calamine               | B                               | H                                | 2                                 | 4       |
| 95       | Campia                 | D                               | M                                | 2                                 | 2       |
| 96       | Capitola               | D                               | M                                | 4                                 | 4       |
| 97       | Carbondale             | O                               | H                                | 3                                 | 4       |
| 98       | Carlisle               | O                               | H                                | 1                                 | 4       |
|          | Carlos (See Rondeau)   |                                 |                                  |                                   |         |
|          | Caron (See Muskego)    |                                 |                                  |                                   |         |
| 99       | Caryville              | B                               | L                                | 4                                 | 4       |
| 100      | Casco                  | A                               | L                                | 3                                 | 3       |
| 101      | Cathro                 | O                               | H                                | 3                                 | 4       |
| 102      | Ceresco                | B                               | L                                | 2                                 | 2       |
| 103      | Champion               | D                               | M                                | 4                                 | 3       |
| 104      | Channahon              | B                               | M                                | 4                                 | 4       |
| 105      | Charlevoix             | D                               | M                                | 3                                 | 4       |
| 106      | Chaseburg              | A                               | L                                | 1                                 | 1       |
| 107      | Chelmo                 | C                               | M                                | 4                                 | 4       |
| 108      | Chelsea                | E                               | L                                | 4                                 | 4       |
| 109      | Chetek                 | E                               | L                                | 4                                 | 4       |
| 110      | Chickney               | D                               | M                                | 4                                 | 3       |
| 111      | Chippeny               | O                               | H                                | 4                                 | 4       |
| 112      | Churchtown             | A                               | M                                | 1                                 | 1       |
| 113      | Citypoint              | O                               | H                                | 4                                 | 4       |
|          | Clifford (See Magnor)  |                                 |                                  |                                   |         |
|          | Cloquet (See Keweenaw) |                                 |                                  |                                   |         |
| 114      | Clyde                  | B                               | M                                | 1                                 | 3       |
| 115      | Coffeen                | B                               | L                                | 1                                 | 2       |
| 116      | Coffton                | B                               | L                                | 1                                 | 2       |
| 117      | Coloma                 | E                               | L                                | 4                                 | 4       |
| 118      | Colwood                | B                               | M                                | 2                                 | 3       |
| 119      | Comstock               | D                               | M                                | 2                                 | 2       |
| 120      | Conover                | A                               | M                                | 1                                 | 2       |
| 121      | Cormant                | E                               | L                                | 4                                 | 4       |
| 122      | Cornucopia             | C                               | M                                | 4                                 | 2       |
| 123      | Cosad                  | C                               | L                                | 4                                 | 3       |
| 124      | Council                | A                               | L                                | 1                                 | 1       |
| 125      | Cress                  | E                               | L                                | 4                                 | 4       |
| 126      | Crex                   | E                               | L                                | 4                                 | 4       |
| 127      | Cromwell               | E                               | L                                | 4                                 | 4       |
| 128      | Crossett               | C                               | M                                | 3                                 | 3       |
| 129      | Croswell               | E                               | L                                | 4                                 | 4       |
| 130      | Croswood               | E                               | L                                | 4                                 | 4       |
| 131      | Crystal Lake           | D                               | M                                | 1                                 | 1       |
| 132      | Cublake                | D                               | M                                | 4                                 | 3       |
| 133      | Cunard                 | D                               | M                                | 3                                 | 3       |
| 134      | Curran                 | A                               | M                                | 1                                 | 2       |
| 135      | Cushing                | D                               | M                                | 3                                 | 2       |
| 136      | Cuttre                 | C                               | M                                | 4                                 | 3       |
| 137      | Dagwagi                | C                               | M                                | 4                                 | 4       |
| 138      | Dakota                 | B                               | M                                | 2                                 | 3       |
|          | Dalbo (See Taylor)     |                                 |                                  |                                   |         |
| 139      | Dancy                  | E                               | M                                | 4                                 | 4       |
| 140      | Darroch                | B                               | M                                | 1                                 | 2       |
| 141      | Dawsil                 | O                               | H                                | 4                                 | 4       |
| 142      | Dawson                 | O                               | H                                | 4                                 | 4       |
| 143      | Dechamps               | E                               | L                                | 4                                 | 4       |
| 144      | Deerton                | E                               | L                                | 4                                 | 4       |
| 145      | Deford                 | E                               | L                                | 4                                 | 4       |
| 146      | Del Rey                | A                               | M                                | 1                                 | 2       |
| 147      | Dells                  | A                               | M                                | 2                                 | 3       |
| 148      | Delton                 | C                               | M                                | 3                                 | 3       |
| 149      | Demontreville          | D                               | M                                | 4                                 | 3       |
| 150      | Denomie                | C                               | M                                | 4                                 | 3       |
| 151      | Denrock                | B                               | M                                | 2                                 | 2       |
| 152      | Derinda                | A                               | M                                | 3                                 | 3       |
|          | Detour (See Solona)    |                                 |                                  |                                   |         |
| 153      | Dickinson              | B                               | M                                | 3                                 | 3       |
| 154      | Dickman                | B                               | M                                | 4                                 | 4       |
|          | Dillon (See Newton)    |                                 |                                  |                                   |         |
| 155      | Dobie                  | D                               | M                                | 3                                 | 3       |
| 156      | Docklake               | D                               | M                                | 3                                 | 3       |
| 157      | Dodge                  | A                               | M                                | 2                                 | 2       |
| 158      | Dodgeville             | B                               | M                                | 2                                 | 2       |
| 159      | Dody                   | C                               | M                                | 4                                 | 4       |
| 160      | Dolph                  | D                               | M                                | 3                                 | 3       |
| 161      | Dorchester             | A                               | M                                | 1                                 | 2       |
| 162      | Dorerton               | A                               | M                                | 3                                 | 3       |
| 163      | Doritty                | A                               | M                                | 1                                 | 1       |
| 164      | Downs                  | A                               | M                                | 1                                 | 1       |
| 165      | Dresden                | A                               | L                                | 2                                 | 2       |
| 166      | Drammen                | E                               | L                                | 4                                 | 4       |
| 167      | Drummer                | B                               | M                                | 1                                 | 3       |
| 168      | Dryburg                | C                               | L                                | 4                                 | 2       |
| 169      | Dubuque                | A                               | M                                | 3                                 | 2       |
| 170      | Duel                   | E                               | L                                | 4                                 | 4       |
| 171      | Duelm                  | E                               | L                                | 4                                 | 4       |
|          | Duluth (See Amery)     |                                 |                                  |                                   |         |
| 172      | Dunbarton              | A                               | H                                | 4                                 | 4       |
| 173      | Dunbot                 | B                               | M                                | 3                                 | 3       |
| 174      | Dunnville              | B                               | L                                | 3                                 | 3       |
| 175      | Durand                 | B                               | M                                | 1                                 | 1       |
|          | Dusler (See Oesterle)  |                                 |                                  |                                   |         |
| 176      | Eaglebay               | C                               | M                                | 4                                 | 2       |
|          | East Lake (See Vilas)  |                                 |                                  |                                   |         |
| 177      | Ea Claire              | D                               | M                                | 4                                 | 3       |
|          | Eaupleine (See Freeon) |                                 |                                  |                                   |         |
| 178      | Edmund                 | B                               | M                                | 3                                 | 3       |
| 179      | Edwards                | O                               | H                                | 3                                 | 4       |
| 180      | Elbaville              | A                               | M                                | 2                                 | 1       |
| 181      | Elburn                 | B                               | M                                | 1                                 | 2       |

<sup>a</sup> Description of subsoil groups are given in table 11. <sup>b</sup> Subsoil sulfur code: L = 5 lb/a; M = 10 lb/a; H = 20 lb/a.

<sup>c</sup> Yield potential code: 1 = very high; 2 = high; 3 = medium; 4 = low.



| Soil no. | Soil name               | Subsoil group code <sup>a</sup> | Subsoil sulfur code <sup>b</sup> | Yield potential code <sup>c</sup> |         |
|----------|-------------------------|---------------------------------|----------------------------------|-----------------------------------|---------|
|          |                         |                                 |                                  | Corn                              | Alfalfa |
| 182      | Elderon                 | E                               | L                                | 4                                 | 4       |
| 183      | Eleroy                  | A                               | M                                | 2                                 | 2       |
| 184      | Eleva                   | A                               | M                                | 3                                 | 2       |
| 185      | Elevasil                | A                               | M                                | 4                                 | 3       |
| 186      | Elkmound                | E                               | M                                | 4                                 | 4       |
| 187      | Ella                    | A                               | M                                | 1                                 | 1       |
| 188      | Elliott                 | B                               | M                                | 1                                 | 2       |
| 189      | Ellwood                 | C                               | M                                | 3                                 | 3       |
| 190      | Elm Lake                | E                               | M                                | 4                                 | 4       |
| 191      | Elvers                  | A                               | M                                | 2                                 | 3       |
| 192      | Emmert                  | E                               | L                                | 4                                 | 4       |
| 193      | Emmet                   | D                               | L                                | 3                                 | 3       |
|          | Ensign (See Bonduel)    |                                 |                                  |                                   |         |
| 194      | Ensley                  | D                               | L                                | 3                                 | 3       |
|          | Etter (See Military)    |                                 |                                  |                                   |         |
| 195      | Ettrick                 | B                               | L                                | 1                                 | 3       |
| 196      | Evart                   | E                               | L                                | 4                                 | 4       |
| 197      | Fabius                  | B                               | L                                | 3                                 | 3       |
| 198      | Fairchild               | E                               | L                                | 4                                 | 4       |
| 199      | Fairport                | D                               | L                                | 3                                 | 2       |
| 200      | Fallcreek               | D                               | M                                | 2                                 | 3       |
| 201      | Farrington              | E                               | L                                | 4                                 | 4       |
| 202      | Fayette                 | A                               | M                                | 1                                 | 1       |
| 203      | Fence                   | D                               | M                                | 4                                 | 2       |
| 204      | Fenwood                 | D                               | H                                | 3                                 | 2       |
|          | Fifield (See Worcester) |                                 |                                  |                                   |         |
| 205      | Finchford               | E                               | L                                | 4                                 | 4       |
| 206      | Fisk                    | D                               | L                                | 3                                 | 3       |
| 207      | Flagg                   | A                               | M                                | 1                                 | 1       |
| 208      | Flagriver               | D                               | M                                | 4                                 | 3       |
| 209      | Flambeau                | D                               | H                                | 2                                 | 2       |
| 210      | Flink                   | E                               | L                                | 4                                 | 4       |
| 211      | Floyd                   | B                               | M                                | 1                                 | 2       |
| 212      | Forada                  | B                               | M                                | 2                                 | 3       |
| 213      | Fordum                  | A                               | L                                | 3                                 | 4       |
| 214      | Forkhorn                | A                               | M                                | 3                                 | 3       |
| 215      | Fox                     | A                               | H                                | 2                                 | 2       |
| 216      | Frechette               | C                               | M                                | 4                                 | 2       |
| 217      | Freeon                  | D                               | M                                | 3                                 | 2       |
| 218      | Freer                   | D                               | M                                | 3                                 | 2       |
| 219      | Freya                   | C                               | M                                | 4                                 | 4       |
| 220      | Friendship              | E                               | L                                | 4                                 | 4       |
| 221      | Friesland               | B                               | M                                | 2                                 | 1       |
| 222      | Frogbay                 | C                               | M                                | 4                                 | 3       |
| 223      | Froberg                 | C                               | M                                | 4                                 | 3       |
| 224      | Gaastra                 | D                               | M                                | 4                                 | 3       |
| 225      | Gale                    | A                               | M                                | 3                                 | 2       |
| 226      | Gander                  | E                               | L                                | 4                                 | 4       |
| 227      | Gaphill                 | A                               | L                                | 3                                 | 3       |
| 228      | Gardenvale              | A                               | M                                | 3                                 | 3       |
| 229      | Garne                   | E                               | L                                | 4                                 | 4       |
| 230      | Garwin                  | B                               | M                                | 1                                 | 3       |
|          | Gay (See Capitola)      |                                 |                                  |                                   |         |
| 231      | Gastrow                 | D                               | M                                | 4                                 | 3       |
| 232      | Gichigami               | C                               | M                                | 4                                 | 3       |
| 233      | Gilford                 | A                               | M                                | 2                                 | 3       |
| 234      | Glendenning             | D                               | M                                | 3                                 | 3       |
| 235      | Glendora                | E                               | L                                | 4                                 | 4       |
| 236      | Gogebic                 | D                               | M                                | 4                                 | 3       |
| 237      | Goodman                 | D                               | M                                | 3                                 | 2       |
| 238      | Goodwit                 | D                               | M                                | 3                                 | 2       |
| 239      | Gosil                   | E                               | L                                | 4                                 | 4       |
| 240      | Gotham                  | E                               | L                                | 4                                 | 4       |
| 241      | Granby                  | E                               | L                                | 4                                 | 4       |
| 242      | Grassylake              | D                               | M                                | 3                                 | 3       |
| 243      | Graycalm                | E                               | L                                | 4                                 | 4       |
| 244      | Grayling                | E                               | L                                | 4                                 | 4       |
| 245      | Grays                   | B                               | M                                | 1                                 | 1       |
| 246      | Greenwood               | O                               | H                                | 4                                 | 4       |
| 247      | Grellton                | A                               | L                                | 2                                 | 1       |
| 248      | Grettum                 | E                               | L                                | 4                                 | 4       |
| 249      | Griswold                | B                               | L                                | 2                                 | 2       |
| 250      | Guenther                | E                               | M                                | 4                                 | 3       |
| 251      | Halder                  | D                               | M                                | 3                                 | 3       |
| 252      | Hatley                  | D                               | M                                | 3                                 | 3       |
| 253      | Haugen                  | D                               | M                                | 3                                 | 3       |
| 254      | Hayfield                | A                               | M                                | 2                                 | 2       |
| 255      | Hayriver                | D                               | M                                | 4                                 | 3       |
| 256      | Hebron                  | A                               | M                                | 1                                 | 2       |
| 257      | Hegge                   | C                               | M                                | 4                                 | 4       |
| 258      | Hemlock                 | E                               | L                                | 4                                 | 4       |
| 259      | Hennepin                | A                               | L                                | 4                                 | 3       |
| 260      | Herbster                | C                               | M                                | 4                                 | 3       |
| 261      | Hersey                  | A                               | M                                | 1                                 | 1       |
| 262      | Hesch                   | B                               | L                                | 3                                 | 3       |
|          | Hessel (See Alstad)     |                                 |                                  |                                   |         |
| 263      | Hibbing                 | C                               | M                                | 4                                 | 2       |
| 264      | Highbridge              | C                               | M                                | 4                                 | 3       |
| 265      | Hiles                   | D                               | H                                | 3                                 | 3       |
|          | Hillcrest (See Downs)   |                                 |                                  |                                   |         |
|          | Hitt (See Dodgeville)   |                                 |                                  |                                   |         |
| 266      | Hixton                  | A                               | M                                | 3                                 | 3       |
| 267      | Hochheim                | B                               | L                                | 2                                 | 2       |
| 268      | Hoop                    | B                               | L                                | 3                                 | 3       |
| 269      | Hoopeston               | B                               | L                                | 3                                 | 3       |
| 270      | Hortonville             | C                               | M                                | 2                                 | 1       |
| 271      | Houghton                | O                               | H                                | 1                                 | 4       |
| 272      | Hubbard                 | E                               | L                                | 4                                 | 4       |
| 273      | Humbird                 | D                               | L                                | 4                                 | 4       |
| 274      | Huntsville              | B                               | M                                | 1                                 | 1       |

(continued)

**Table 10.** (continued)

| Soil no. | Soil name                 | Subsoil group code <sup>a</sup> | Subsoil sulfur code <sup>b</sup> | Yield potential code <sup>c</sup> |         |
|----------|---------------------------|---------------------------------|----------------------------------|-----------------------------------|---------|
|          |                           |                                 |                                  | Corn                              | Alfalfa |
| 275      | Impact                    | E                               | M                                | 4                                 | 4       |
| 276      | Ingalls                   | E                               | L                                | 4                                 | 4       |
| 277      | Ionia                     | A                               | M                                | 1                                 | 2       |
| 278      | Iosco                     | D                               | M                                | 4                                 | 3       |
| 279      | Ironrun                   | E                               | L                                | 4                                 | 4       |
|          | Iron River (See Wabeno)   |                                 |                                  |                                   |         |
|          | Isan (See Newson)         |                                 |                                  |                                   |         |
|          | Isanti (See Newson)       |                                 |                                  |                                   |         |
| 280      | Ishpeming                 | E                               | L                                | 4                                 | 4       |
| 281      | Jackson                   | A                               | M                                | 1                                 | 1       |
| 282      | Jasper                    | B                               | M                                | 1                                 | 1       |
| 283      | Jewett                    | B                               | H                                | 3                                 | 2       |
| 284      | Joy                       | B                               | M                                | 1                                 | 2       |
| 285      | Juda                      | B                               | M                                | 1                                 | 1       |
| 286      | Judson                    | B                               | L                                | 1                                 | 1       |
| 287      | Juneau                    | A                               | M                                | 1                                 | 1       |
| 288      | Kakagon                   | C                               | M                                | 4                                 | 4       |
|          | Kalamazoo (See Fox)       |                                 |                                  |                                   |         |
|          | Kalkaska (See Vilas)      |                                 |                                  |                                   |         |
| 289      | Kalmarville               | A                               | M                                | 4                                 | 4       |
| 290      | Kane                      | B                               | M                                | 2                                 | 2       |
| 291      | Karlin                    | E                               | L                                | 4                                 | 4       |
| 292      | Karlsborg                 | C                               | M                                | 4                                 | 3       |
| 293      | Kato                      | B                               | M                                | 1                                 | 3       |
| 294      | Kaukauna                  | C                               | M                                | 2                                 | 1       |
| 295      | Kegonsa                   | B                               | L                                | 2                                 | 2       |
| 296      | Kellogg                   | C                               | M                                | 4                                 | 3       |
| 297      | Keltner                   | B                               | M                                | 2                                 | 2       |
| 298      | Kendall                   | A                               | M                                | 1                                 | 2       |
| 299      | Kennan                    | D                               | M                                | 4                                 | 2       |
| 300      | Keowns                    | B                               | H                                | 2                                 | 3       |
| 301      | Kert                      | D                               | M                                | 3                                 | 3       |
| 302      | Keshena                   | C                               | M                                | 3                                 | 2       |
| 303      | Kevilar                   | A                               | M                                | 4                                 | 3       |
| 304      | Kewaunee                  | C                               | M                                | 2                                 | 1       |
| 305      | Keweenaw                  | E                               | L                                | 4                                 | 4       |
| 306      | Kibbie                    | B                               | M                                | 2                                 | 2       |
| 307      | Kickapoo                  | A                               | L                                | 3                                 | 3       |
| 308      | Kidder                    | A                               | M                                | 2                                 | 2       |
| 309      | Kinepoway                 | D                               | M                                | 4                                 | 3       |
| 310      | Kingsville                | E                               | M                                | 3                                 | 3       |
| 311      | Kinross                   | E                               | M                                | 4                                 | 4       |
| 312      | Kiva                      | E                               | L                                | 4                                 | 4       |
| 313      | Knowles                   | A                               | L                                | 3                                 | 2       |
| 314      | Kolberg                   | C                               | M                                | 3                                 | 2       |
| 315      | Komro                     | E                               | L                                | 4                                 | 4       |
| 316      | Korobago                  | C                               | L                                | 3                                 | 3       |
| 317      | Kost                      | E                               | L                                | 4                                 | 4       |
| 318      | Kranski                   | E                               | L                                | 4                                 | 3       |
| 319      | La Farge                  | A                               | M                                | 2                                 | 2       |
| 320      | Labelle                   | C                               | M                                | 4                                 | 3       |
|          | Lafont (See Sarona)       |                                 |                                  |                                   |         |
| 321      | Lamartine                 | A                               | M                                | 1                                 | 2       |
| 322      | Lamont                    | E                               | M                                | 3                                 | 4       |
| 323      | Langlade                  | D                               | H                                | 3                                 | 2       |
| 324      | Laona                     | D                               | M                                | 4                                 | 3       |
| 325      | Lapeer                    | A                               | M                                | 3                                 | 3       |
| 326      | Lapoin                    | C                               | M                                | 4                                 | 3       |
| 327      | Lara                      | C                               | M                                | 4                                 | 4       |
| 328      | Lawler                    | B                               | M                                | 2                                 | 2       |
| 329      | Lawson                    | B                               | M                                | 1                                 | 2       |
|          | Leelanau (See Menominee)  |                                 |                                  |                                   |         |
|          | Lena (See Houghton)       |                                 |                                  |                                   |         |
|          | Lenawee (See Montgomery)  |                                 |                                  |                                   |         |
| 330      | Leola                     | E                               | L                                | 4                                 | 4       |
| 331      | Lerch                     | C                               | H                                | 4                                 | 4       |
| 332      | Leroy                     | A                               | L                                | 3                                 | 2       |
| 333      | Lindstrom                 | B                               | M                                | 1                                 | 1       |
| 334      | Lino                      | E                               | M                                | 4                                 | 4       |
|          | Linwood (See Palms)       |                                 |                                  |                                   |         |
|          | Littleton (See Lawson)    |                                 |                                  |                                   |         |
| 335      | Lobo                      | O                               | H                                | 4                                 | 4       |
| 336      | Locke                     | B                               | M                                | 3                                 | 3       |
| 337      | Lomira                    | A                               | M                                | 2                                 | 2       |
| 338      | Longrie                   | D                               | M                                | 3                                 | 3       |
| 339      | Lorenzo                   | B                               | M                                | 3                                 | 3       |
| 340      | Lows                      | B                               | M                                | 3                                 | 3       |
| 341      | Loxley                    | O                               | M                                | 4                                 | 4       |
| 342      | Loyal                     | D                               | M                                | 2                                 | 2       |
| 343      | Ludington                 | E                               | M                                | 4                                 | 4       |
|          | Lunds (See Worcester)     |                                 |                                  |                                   |         |
| 344      | Lupton                    | O                               | H                                | 4                                 | 4       |
| 345      | Lutzke                    | A                               | M                                | 3                                 | 3       |
|          | Mackinac (See Charlevoix) |                                 |                                  |                                   |         |
| 346      | Magnor                    | D                               | M                                | 2                                 | 2       |
| 347      | Magroc                    | D                               | M                                | 2                                 | 2       |
| 348      | Mahalasville              | B                               | H                                | 1                                 | 3       |
| 349      | Mahtomedi                 | E                               | L                                | 4                                 | 4       |
|          | Mahtowa (See Capitola)    |                                 |                                  |                                   |         |
| 350      | Majik                     | E                               | L                                | 4                                 | 4       |
| 351      | Manawa                    | C                               | M                                | 2                                 | 2       |
| 352      | Mancelona                 | E                               | L                                | 4                                 | 4       |
| 353      | Manistee                  | C                               | M                                | 4                                 | 3       |
| 354      | Manitowish                | E                               | L                                | 4                                 | 4       |
| 355      | Mann                      | D                               | M                                | 3                                 | 3       |
| 356      | Maplehurst                | D                               | H                                | 3                                 | 2       |
|          | Maraglade (See Magnor)    |                                 |                                  |                                   |         |
| 357      | Marathon                  | D                               | H                                | 3                                 | 2       |
| 358      | Marcellon                 | B                               | M                                | 2                                 | 3       |
| 359      | Markesan                  | B                               | M                                | 2                                 | 2       |

<sup>a</sup> Description of subsoil groups are given in table 11. <sup>b</sup> Subsoil sulfur code: L = 5 lb/a; M = 10 lb/a; H = 20 lb/a.

<sup>c</sup> Yield potential code: 1 = very high; 2 = high; 3 = medium; 4 = low.



| Soil no. | Soil name                   | Subsoil group code <sup>a</sup> | Subsoil sulfur code <sup>b</sup> | Yield potential code <sup>c</sup> |         |
|----------|-----------------------------|---------------------------------|----------------------------------|-----------------------------------|---------|
|          |                             |                                 |                                  | Corn                              | Alfalfa |
| 360      | Markey                      | O                               | H                                | 4                                 | 4       |
| 361      | Markham                     | B                               | M                                | 2                                 | 1       |
| 362      | Marshan                     | B                               | M                                | 2                                 | 3       |
| 363      | Marshfield                  | D                               | M                                | 2                                 | 3       |
| 364      | Martinton                   | B                               | M                                | 1                                 | 2       |
| 365      | Matherton                   | B                               | L                                | 2                                 | 2       |
| 366      | Maumee                      | E                               | L                                | 4                                 | 4       |
| 367      | Mayville                    | A                               | M                                | 1                                 | 1       |
| 368      | McHenry                     | A                               | M                                | 2                                 | 2       |
| 369      | Meadland                    | D                               | M                                | 3                                 | 2       |
| 370      | Mecan                       | A                               | L                                | 3                                 | 3       |
| 371      | Mecosta                     | E                               | L                                | 4                                 | 4       |
| 372      | Medary                      | C                               | M                                | 2                                 | 2       |
| 373      | Meehan                      | E                               | L                                | 4                                 | 4       |
| 374      | Meenon                      | C                               | M                                | 4                                 | 3       |
| 375      | Menahga                     | E                               | L                                | 4                                 | 4       |
| 376      | Menasha                     | C                               | M                                | 3                                 | 3       |
| 377      | Mendota                     | B                               | M                                | 2                                 | 2       |
| 378      | Menomin                     | A                               | M                                | 3                                 | 3       |
| 379      | Menominee                   | D                               | M                                | 4                                 | 3       |
| 380      | Mequithy                    | D                               | M                                | 4                                 | 3       |
| 381      | Mequon                      | C                               | M                                | 2                                 | 2       |
| 382      | Meridian                    | A                               | M                                | 3                                 | 3       |
| 383      | Merimod                     | A                               | M                                | 3                                 | 2       |
| 384      | Merit                       | A                               | M                                | 3                                 | 2       |
| 385      | Merrillan                   | D                               | M                                | 4                                 | 4       |
|          | Merwin (See Greenwood)      |                                 |                                  |                                   |         |
| 386      | Metea                       | A                               | M                                | 3                                 | 3       |
| 387      | Metonga                     | D                               | M                                | 4                                 | 3       |
| 388      | Miami                       | A                               | L                                | 2                                 | 2       |
| 389      | Michigamme                  | D                               | M                                | 3                                 | 3       |
| 390      | Mifflin                     | A                               | L                                | 3                                 | 3       |
| 391      | Milford                     | B                               | M                                | 1                                 | 3       |
| 392      | Military                    | A                               | L                                | 3                                 | 3       |
| 393      | Milladore                   | D                               | M                                | 3                                 | 2       |
|          | Millerville (See Greenwood) |                                 |                                  |                                   |         |
| 394      | Millington                  | B                               | M                                | 1                                 | 3       |
| 395      | Millsdale                   | C                               | M                                | 3                                 | 4       |
| 396      | Milton                      | A                               | M                                | 3                                 | 2       |
| 397      | Mindoro                     | E                               | L                                | 4                                 | 4       |
| 398      | Minocqua                    | D                               | M                                | 3                                 | 3       |
| 399      | Miskoaki                    | C                               | M                                | 4                                 | 3       |
| 400      | Moberg                      | D                               | L                                | 4                                 | 4       |
| 401      | Monico                      | D                               | M                                | 3                                 | 2       |
| 402      | Montello                    | B                               | M                                | 2                                 | 1       |
| 403      | Montgomery                  | B                               | M                                | 2                                 | 3       |
|          | Mooselake (See Rifle)       |                                 |                                  |                                   |         |
| 404      | Moodig                      | D                               | M                                | 3                                 | 2       |
| 405      | Moppet                      | D                               | M                                | 4                                 | 3       |
| 406      | Moquah                      | D                               | M                                | 4                                 | 3       |
| 407      | Mora                        | D                               | L                                | 4                                 | 3       |
| 408      | Morganlake                  | D                               | M                                | 4                                 | 3       |
| 409      | Morley                      | C                               | M                                | 2                                 | 1       |
| 410      | Morocco                     | E                               | L                                | 4                                 | 4       |
| 411      | Mosel                       | B                               | M                                | 2                                 | 2       |
| 412      | Mosinee                     | D                               | L                                | 4                                 | 3       |
| 413      | Moundville                  | E                               | L                                | 4                                 | 4       |
| 414      | Mt. Carroll                 | B                               | M                                | 1                                 | 1       |
| 415      | Mudlake                     | D                               | M                                | 4                                 | 3       |
| 416      | Mundelein                   | B                               | M                                | 1                                 | 2       |
|          | Munising (See Gogebic)      |                                 |                                  |                                   |         |
| 417      | Munuscong                   | C                               | M                                | 4                                 | 4       |
| 418      | Muscatine                   | B                               | M                                | 1                                 | 2       |
| 419      | Muskego                     | O                               | H                                | 3                                 | 4       |
| 420      | Mussey                      | B                               | L                                | 3                                 | 4       |
| 421      | Mylrea                      | D                               | M                                | 3                                 | 2       |
| 422      | Myrtle                      | A                               | M                                | 1                                 | 1       |
| 423      | Nadeau                      | D                               | L                                | 4                                 | 3       |
| 424      | Nahma                       | D                               | H                                | 4                                 | 4       |
| 425      | Namur                       | D                               | M                                | 4                                 | 4       |
| 426      | Navan                       | B                               | M                                | 1                                 | 4       |
| 427      | Nebago                      | C                               | M                                | 4                                 | 3       |
| 428      | Neconish                    | E                               | L                                | 4                                 | 3       |
| 429      | Neda                        | B                               | M                                | 2                                 | 2       |
| 430      | Neenah                      | C                               | M                                | 3                                 | 2       |
|          | Nemadji (See Au Gres)       |                                 |                                  |                                   |         |
| 431      | Nenno                       | B                               | M                                | 2                                 | 3       |
| 432      | Neopit                      | D                               | H                                | 4                                 | 2       |
| 433      | Nester                      | C                               | M                                | 3                                 | 2       |
|          | Newaygo (See Padus)         |                                 |                                  |                                   |         |
| 434      | Newglarus                   | A                               | H                                | 4                                 | 3       |
| 435      | Newlang                     | E                               | L                                | 4                                 | 4       |
|          | Newvienna (See Seaton)      |                                 |                                  |                                   |         |
| 436      | Newood                      | D                               | M                                | 4                                 | 3       |
| 437      | Newot                       | D                               | M                                | 4                                 | 3       |
| 438      | Newson                      | E                               | M                                | 4                                 | 4       |
| 439      | Newton                      | E                               | M                                | 4                                 | 4       |
| 440      | Nichols                     | A                               | L                                | 2                                 | 2       |
| 441      | Nickin                      | B                               | L                                | 3                                 | 3       |
| 442      | Nokasippi                   | D                               | M                                | 4                                 | 4       |
| 443      | Norden                      | A                               | M                                | 2                                 | 2       |
| 444      | Norgo                       | D                               | M                                | 4                                 | 4       |
|          | Norrie (See Kennan)         |                                 |                                  |                                   |         |
| 445      | Northbend                   | A                               | L                                | 3                                 | 3       |
| 446      | Northfield                  | E                               | L                                | 4                                 | 4       |
| 447      | Northmound                  | D                               | M                                | 4                                 | 3       |
|          | Norwalk (See Reedsburg)     |                                 |                                  |                                   |         |
| 448      | Noseum                      | E                               | L                                | 4                                 | 4       |
| 449      | Nymore                      | E                               | L                                | 4                                 | 4       |
| 450      | Oakville                    | E                               | L                                | 4                                 | 4       |

(continued)



**Table 10.** (continued)

| Soil no. | Soil name              | Subsoil group code <sup>a</sup> | Subsoil sulfur code <sup>b</sup> | Yield potential code <sup>c</sup> |         |
|----------|------------------------|---------------------------------|----------------------------------|-----------------------------------|---------|
|          |                        |                                 |                                  | Corn                              | Alfalfa |
| 451      | Ockley                 | A                               | L                                | 1                                 | 1       |
| 452      | Oconto                 | D                               | L                                | 3                                 | 3       |
| 453      | Odanah                 | C                               | M                                | 4                                 | 3       |
| 454      | Oesterle               | D                               | M                                | 3                                 | 3       |
|          | Ogden (See Willette)   |                                 |                                  |                                   |         |
| 455      | Ogle                   | B                               | M                                | 1                                 | 1       |
| 456      | Okee                   | A                               | M                                | 4                                 | 3       |
| 457      | Omega                  | E                               | L                                | 4                                 | 4       |
| 458      | Omena                  | D                               | M                                | 4                                 | 3       |
| 459      | Omro                   | C                               | M                                | 3                                 | 2       |
|          | Onamia (See Rosholt)   |                                 |                                  |                                   |         |
| 460      | Onaway                 | C                               | L                                | 3                                 | 2       |
| 461      | Ontonagon              | C                               | M                                | 4                                 | 2       |
|          | Orienta (See Rimer)    |                                 |                                  |                                   |         |
| 462      | Orion                  | A                               | L                                | 1                                 | 2       |
| 463      | Oronto                 | C                               | M                                | 4                                 | 3       |
| 464      | Oshkosh                | C                               | M                                | 3                                 | 1       |
| 465      | Oshtemo                | A                               | M                                | 3                                 | 3       |
|          | Osseo (See Orion)      |                                 |                                  |                                   |         |
| 466      | Ossian                 | B                               | H                                | 1                                 | 3       |
| 467      | Ossmer                 | D                               | M                                | 4                                 | 3       |
| 468      | Ostrander              | B                               | M                                | 1                                 | 1       |
| 469      | Otter                  | B                               | M                                | 1                                 | 3       |
| 470      | Otterholt              | D                               | M                                | 2                                 | 2       |
|          | Owosso (See Kidder)    |                                 |                                  |                                   |         |
| 471      | Ozaukee                | C                               | M                                | 2                                 | 2       |
| 472      | Padus                  | D                               | M                                | 4                                 | 3       |
| 473      | Padwet                 | D                               | M                                | 4                                 | 3       |
| 474      | Padwood                | D                               | M                                | 4                                 | 3       |
| 475      | Palms                  | O                               | H                                | 2                                 | 4       |
| 476      | Palsgrove              | A                               | M                                | 1                                 | 1       |
| 477      | Pardeeville            | B                               | M                                | 3                                 | 3       |
|          | Parent (See Capitola)  |                                 |                                  |                                   |         |
| 478      | Partridge              | D                               | L                                | 4                                 | 4       |
| 479      | Pearl                  | E                               | L                                | 4                                 | 4       |
| 480      | Pecatonica             | A                               | M                                | 1                                 | 1       |
| 481      | Pecore                 | D                               | M                                | 4                                 | 3       |
| 482      | Peebles                | C                               | M                                | 2                                 | 1       |
| 483      | Pelissier              | E                               | L                                | 4                                 | 4       |
| 484      | Pelkie                 | E                               | L                                | 4                                 | 4       |
| 485      | Pella                  | B                               | M                                | 1                                 | 3       |
| 486      | Pence                  | E                               | L                                | 4                                 | 3       |
| 487      | Pepin                  | A                               | M                                | 1                                 | 1       |
| 488      | Pequaming              | E                               | L                                | 4                                 | 4       |
| 489      | Perchlake              | E                               | L                                | 4                                 | 4       |
| 490      | Perida                 | E                               | L                                | 4                                 | 4       |
| 491      | Perote                 | C                               | M                                | 4                                 | 2       |
| 492      | Pesabic                | D                               | M                                | 4                                 | 3       |
| 493      | Peshekee               | D                               | M                                | 4                                 | 4       |
| 494      | Peshtigo               | D                               | M                                | 4                                 | 3       |
| 495      | Pickford               | C                               | M                                | 4                                 | 3       |
| 496      | Pillot                 | B                               | H                                | 2                                 | 2       |
| 497      | Pinconning             | C                               | M                                | 4                                 | 4       |
|          | Pistakee (See Radford) |                                 |                                  |                                   |         |
| 498      | Plainbo                | E                               | L                                | 4                                 | 4       |
| 499      | Plainfield             | E                               | M                                | 4                                 | 4       |
| 500      | Plano                  | B                               | M                                | 1                                 | 1       |
|          | Pleine (See Capitola)  |                                 |                                  |                                   |         |
| 501      | Plover                 | D                               | M                                | 3                                 | 3       |
| 502      | Plumcreek              | A                               | M                                | 3                                 | 3       |
| 503      | Point                  | B                               | M                                | 3                                 | 3       |
| 504      | Pomroy                 | D                               | M                                | 4                                 | 3       |
| 505      | Ponycreek              | E                               | L                                | 4                                 | 4       |
| 506      | Port Byron             | B                               | M                                | 1                                 | 1       |
| 507      | Portwing               | C                               | M                                | 4                                 | 2       |
| 508      | Poskin                 | D                               | M                                | 2                                 | 2       |
| 509      | Poy                    | C                               | M                                | 3                                 | 3       |
| 510      | Poygan                 | C                               | M                                | 2                                 | 3       |
|          | Prebish (See Wormet)   |                                 |                                  |                                   |         |
| 511      | Prissel                | E                               | L                                | 4                                 | 3       |
| 512      | Puchyan                | A                               | M                                | 4                                 | 3       |
| 513      | Quarderer              | D                               | M                                | 1                                 | 1       |
| 514      | Rabe                   | C                               | M                                | 4                                 | 3       |
| 515      | Racine                 | A                               | M                                | 2                                 | 2       |
| 516      | Radford                | B                               | H                                | 2                                 | 2       |
| 517      | Rasset                 | B                               | M                                | 3                                 | 3       |
| 518      | Redrim                 | E                               | L                                | 4                                 | 4       |
| 519      | Reedsburg              | A                               | M                                | 1                                 | 2       |
| 520      | Renova                 | B                               | M                                | 1                                 | 2       |
| 521      | Rib                    | D                               | M                                | 4                                 | 4       |
| 522      | Ribhill                | D                               | M                                | 3                                 | 3       |
| 523      | Ribriver               | D                               | H                                | 3                                 | 2       |
| 524      | Richford               | E                               | M                                | 4                                 | 3       |
|          | Richter (See Gastrow)  |                                 |                                  |                                   |         |
| 525      | Richwood               | B                               | M                                | 1                                 | 1       |
| 526      | Rietbrock              | D                               | M                                | 3                                 | 2       |
| 527      | Rifle                  | O                               | H                                | 4                                 | 4       |
| 528      | Rimer                  | C                               | L                                | 4                                 | 2       |
| 529      | Ringwood               | B                               | M                                | 1                                 | 2       |
| 530      | Ripon                  | B                               | M                                | 2                                 | 2       |
| 531      | Ritchey                | A                               | M                                | 4                                 | 4       |
| 532      | Robago                 | D                               | M                                | 4                                 | 3       |
| 533      | Roby                   | A                               | M                                | 2                                 | 2       |
| 534      | Rockbluff              | E                               | L                                | 4                                 | 4       |
|          | Rockbridge (See Tell)  |                                 |                                  |                                   |         |
| 535      | Rockdam                | E                               | L                                | 4                                 | 4       |
| 536      | Rockers                | D                               | M                                | 4                                 | 3       |
| 537      | Rockmont               | C                               | M                                | 4                                 | 2       |
| 538      | Rockton                | B                               | M                                | 2                                 | 2       |
| 539      | Rodman                 | B                               | L                                | 4                                 | 4       |

<sup>a</sup> Description of subsoil groups are given in table 11. <sup>b</sup> Subsoil sulfur code: L = 5 lb/a; M = 10 lb/a; H = 20 lb/a.

<sup>c</sup> Yield potential code: 1 = very high; 2 = high; 3 = medium; 4 = low.

| Soil no. | Soil name                  | Subsoil group code <sup>a</sup> | Subsoil sulfur code <sup>b</sup> | Yield potential code <sup>c</sup> |         |
|----------|----------------------------|---------------------------------|----------------------------------|-----------------------------------|---------|
|          |                            |                                 |                                  | Corn                              | Alfalfa |
|          | Rollin (See Edwards)       |                                 |                                  |                                   |         |
| 540      | Romanpoint                 | C                               | L                                | 4                                 | 4       |
| 541      | Rondeau                    | O                               | H                                | 4                                 | 4       |
|          | Ronneby (See Glendenning)  |                                 |                                  |                                   |         |
| 542      | Roscommon                  | E                               | L                                | 4                                 | 4       |
| 543      | Rosholt                    | D                               | M                                | 3                                 | 3       |
| 544      | Rotamer                    | B                               | M                                | 3                                 | 2       |
|          | Rothschild (See Mahtomedi) |                                 |                                  |                                   |         |
| 545      | Rousseau                   | E                               | L                                | 4                                 | 4       |
| 546      | Rowley                     | B                               | M                                | 1                                 | 2       |
| 547      | Rozellville                | D                               | M                                | 3                                 | 2       |
| 548      | Rozetta                    | A                               | M                                | 1                                 | 1       |
| 549      | Rubicon                    | E                               | L                                | 4                                 | 4       |
|          | Rudyard (See Cuttre)       |                                 |                                  |                                   |         |
| 550      | Ruse                       | D                               | M                                | 4                                 | 4       |
| 551      | Rusktown                   | A                               | M                                | 3                                 | 3       |
| 552      | Sable                      | B                               | M                                | 1                                 | 4       |
| 553      | Salter                     | A                               | M                                | 3                                 | 3       |
| 554      | Sanborg                    | C                               | M                                | 4                                 | 3       |
| 555      | Sandbay                    | E                               | L                                | 4                                 | 4       |
| 556      | Santiago                   | D                               | M                                | 3                                 | 2       |
| 557      | Sargeant                   | D                               | M                                | 3                                 | 3       |
| 558      | Sarona                     | D                               | M                                | 3                                 | 3       |
|          | Sartell (See Shawano)      |                                 |                                  |                                   |         |
| 559      | Sarwet                     | D                               | M                                | 3                                 | 3       |
| 560      | Sattre                     | B                               | L                                | 3                                 | 2       |
|          | Saugatuck (See Au Gres)    |                                 |                                  |                                   |         |
| 561      | Sawmill                    | B                               | H                                | 1                                 | 1       |
| 562      | Saybrook                   | B                               | M                                | 1                                 | 1       |
| 563      | Saylesville                | A                               | M                                | 2                                 | 2       |
| 564      | Sayner                     | E                               | L                                | 4                                 | 4       |
| 565      | Schapville                 | B                               | M                                | 2                                 | 2       |
| 566      | Schramm                    | C                               | L                                | 4                                 | 2       |
| 567      | Scoba                      | D                               | M                                | 4                                 | 3       |
| 568      | Sconsin                    | D                               | M                                | 3                                 | 3       |
| 569      | Scotah                     | E                               | L                                | 4                                 | 4       |
| 570      | Scott Lake                 | D                               | M                                | 3                                 | 3       |
| 571      | Seaton                     | A                               | M                                | 1                                 | 1       |
| 572      | Sebbo                      | A                               | M                                | 1                                 | 1       |
| 573      | Sebewa                     | B                               | M                                | 2                                 | 4       |
| 574      | Sechler                    | A                               | M                                | 3                                 | 3       |
| 575      | Sedgwick                   | C                               | M                                | 4                                 | 3       |
| 576      | Seeleyville                | O                               | H                                | 3                                 | 4       |
| 577      | Selkirk                    | C                               | M                                | 4                                 | 2       |
| 578      | Seward                     | C                               | M                                | 4                                 | 3       |
| 579      | Shawano                    | E                               | M                                | 4                                 | 4       |
| 580      | Sherry                     | D                               | M                                | 3                                 | 3       |
| 581      | Shiffer                    | B                               | M                                | 2                                 | 3       |
| 582      | Shiocton                   | D                               | M                                | 3                                 | 2       |
| 583      | Shullsburg                 | A                               | L                                | 2                                 | 2       |
| 584      | Silverhill                 | A                               | L                                | 3                                 | 3       |
| 585      | Simescreek                 | E                               | L                                | 4                                 | 4       |
| 586      | Sioux creek                | D                               | M                                | 4                                 | 3       |
| 587      | Sissabagama                | E                               | L                                | 4                                 | 4       |
| 588      | Sisson                     | A                               | M                                | 2                                 | 2       |
|          | Skane (See Tula)           |                                 |                                  |                                   |         |
| 589      | Skyberg                    | A                               | M                                | 2                                 | 2       |
| 590      | Slimlake                   | E                               | L                                | 4                                 | 4       |
| 591      | Smestad                    | D                               | M                                | 4                                 | 3       |
| 592      | Soderville                 | E                               | L                                | 4                                 | 3       |
| 593      | Sogn                       | B                               | L                                | 4                                 | 4       |
| 594      | Solness                    | D                               | M                                | 4                                 | 3       |
| 595      | Solona                     | C                               | L                                | 3                                 | 2       |
| 596      | Sooner                     | A                               | M                                | 2                                 | 3       |
| 597      | Soperton                   | D                               | M                                | 4                                 | 3       |
|          | Spalding (See Greenwood)   |                                 |                                  |                                   |         |
| 598      | Sparta                     | E                               | L                                | 4                                 | 4       |
| 599      | Spencer                    | D                               | M                                | 3                                 | 3       |
| 600      | Spinks                     | E                               | L                                | 4                                 | 4       |
|          | Spirit (See Monico)        |                                 |                                  |                                   |         |
| 601      | Spoonerhill                | E                               | L                                | 4                                 | 3       |
| 602      | St. Charles                | A                               | M                                | 1                                 | 1       |
| 603      | Stambaugh                  | D                               | M                                | 3                                 | 2       |
| 604      | Stengel                    | E                               | L                                | 4                                 | 4       |
| 605      | Stronghurst                | A                               | M                                | 1                                 | 2       |
| 606      | Sturgeon                   | D                               | M                                | 4                                 | 4       |
|          | Suamico (See Willette)     |                                 |                                  |                                   |         |
| 607      | Sultz                      | E                               | L                                | 4                                 | 4       |
| 608      | Summerville                | D                               | M                                | 4                                 | 3       |
|          | Sundell (See Bonduel)      |                                 |                                  |                                   |         |
| 609      | Sunia                      | E                               | L                                | 4                                 | 4       |
| 610      | Sunkencamp                 | E                               | L                                | 4                                 | 4       |
| 611      | Superior                   | C                               | M                                | 4                                 | 2       |
| 612      | Sylvester                  | B                               | M                                | 3                                 | 2       |
| 613      | Symco                      | D                               | M                                | 2                                 | 2       |
| 614      | Symerton                   | B                               | M                                | 1                                 | 2       |
|          | Tacoosh (See Cathro)       |                                 |                                  |                                   |         |
| 615      | Tama                       | B                               | M                                | 1                                 | 1       |
| 616      | Tarr                       | E                               | L                                | 4                                 | 4       |
| 617      | Tawas                      | O                               | H                                | 4                                 | 4       |
| 618      | Taylor                     | C                               | M                                | 4                                 | 2       |
| 619      | Tedrow                     | E                               | L                                | 4                                 | 4       |
| 620      | Tell                       | A                               | M                                | 2                                 | 2       |
| 621      | Terril                     | B                               | M                                | 1                                 | 2       |
| 622      | Thackery                   | A                               | M                                | 1                                 | 2       |
| 623      | Theresa                    | A                               | M                                | 1                                 | 1       |
| 624      | Tilleda                    | D                               | M                                | 3                                 | 2       |
| 625      | Tint                       | E                               | L                                | 4                                 | 4       |
| 626      | Tintson                    | E                               | L                                | 4                                 | 4       |
| 627      | Tipler                     | D                               | M                                | 4                                 | 3       |

(continued)

**Table 10.** (continued)

| Soil no. | Soil name                | Subsoil group code <sup>a</sup> | Subsoil sulfur code <sup>b</sup> | Yield potential code <sup>c</sup> |         |
|----------|--------------------------|---------------------------------|----------------------------------|-----------------------------------|---------|
|          |                          |                                 |                                  | Corn                              | Alfalfa |
| 628      | Toddville                | B                               | M                                | 1                                 | 1       |
| 629      | Tonkey                   | D                               | M                                | 4                                 | 4       |
| 630      | Tourtillotte             | E                               | L                                | 4                                 | 4       |
| 631      | Tradelake                | D                               | M                                | 4                                 | 3       |
| 632      | Trempe                   | E                               | L                                | 4                                 | 4       |
| 633      | Trempealeau              | B                               | M                                | 3                                 | 3       |
|          | Trenary (See Sarona)     |                                 |                                  |                                   |         |
| 634      | Troxel                   | B                               | M                                | 1                                 | 1       |
| 635      | Tula                     | D                               | M                                | 4                                 | 3       |
| 636      | Tuscola                  | A                               | M                                | 2                                 | 2       |
| 637      | Tustin                   | C                               | M                                | 4                                 | 3       |
| 638      | Twinmound                | E                               | L                                | 4                                 | 4       |
|          | Udolpho (See Kane)       |                                 |                                  |                                   |         |
|          | Underhill (See Tilleda)  |                                 |                                  |                                   |         |
| 639      | Urne                     | A                               | M                                | 4                                 | 3       |
| 640      | Valton                   | B                               | M                                | 2                                 | 2       |
| 641      | Vancecreek               | D                               | M                                | 3                                 | 3       |
| 642      | Vanzile                  | D                               | M                                | 3                                 | 3       |
| 643      | Varna                    | B                               | M                                | 2                                 | 1       |
| 644      | Vasa                     | A                               | M                                | 1                                 | 2       |
| 645      | Veedom                   | D                               | M                                | 3                                 | 3       |
| 646      | Vejo                     | E                               | L                                | 4                                 | 4       |
| 647      | Vesper                   | D                               | M                                | 3                                 | 3       |
| 648      | Vilas                    | E                               | L                                | 4                                 | 4       |
| 649      | Virgil                   | B                               | M                                | 1                                 | 2       |
| 650      | Vlasaty                  | D                               | L                                | 2                                 | 2       |
| 651      | Wabeno                   | D                               | M                                | 4                                 | 3       |
| 652      | Wacousta                 | B                               | M                                | 1                                 | 3       |
| 653      | Wahtoahsah               | D                               | M                                | 4                                 | 3       |
| 654      | Wainola                  | E                               | L                                | 4                                 | 3       |
|          | Waiska (See Pelissier)   |                                 |                                  |                                   |         |
| 655      | Wakefield                | D                               | H                                | 4                                 | 2       |
| 656      | Wallkill                 | A                               | M                                | 1                                 | 3       |
| 657      | Warman                   | D                               | H                                | 4                                 | 4       |
| 658      | Warsaw                   | B                               | M                                | 2                                 | 2       |
| 659      | Wasepi                   | A                               | M                                | 3                                 | 3       |
| 660      | Washtenaw                | A                               | M                                | 1                                 | 3       |
|          | Waskish (See Lobo)       |                                 |                                  |                                   |         |
| 661      | Watseka                  | E                               | L                                | 4                                 | 4       |
|          | Watton (See Denomie)     |                                 |                                  |                                   |         |
| 662      | Wauconda                 | B                               | M                                | 1                                 | 2       |
|          | Waukechon (See Sebewa)   |                                 |                                  |                                   |         |
| 663      | Waukegan                 | B                               | M                                | 2                                 | 1       |
| 664      | Waupaca                  | B                               | M                                | 3                                 | 4       |
|          | Wausau (See Mosinee)     |                                 |                                  |                                   |         |
| 665      | Wauseon                  | B                               | M                                | 3                                 | 3       |
| 666      | Wautoma                  | C                               | M                                | 3                                 | 3       |
| 667      | Wayka                    | D                               | M                                | 4                                 | 3       |
| 668      | Waymor                   | A                               | M                                | 3                                 | 2       |
| 669      | Weegwas                  | E                               | L                                | 4                                 | 4       |
| 670      | Wega                     | D                               | M                                | 3                                 | 3       |
| 671      | Westville                | A                               | M                                | 2                                 | 2       |
| 672      | Whalan                   | A                               | M                                | 2                                 | 3       |
| 673      | Wheatley                 | E                               | L                                | 4                                 | 4       |
| 674      | Whisklake                | D                               | M                                | 3                                 | 3       |
| 675      | Whitehall                | B                               | M                                | 2                                 | 2       |
| 676      | Whittlesey               | D                               | M                                | 4                                 | 3       |
| 677      | Wickware                 | A                               | M                                | 1                                 | 1       |
|          | Wien (See Marshfield)    |                                 |                                  |                                   |         |
| 678      | Wildale                  | B                               | M                                | 3                                 | 3       |
| 679      | Wildwood                 | C                               | M                                | 4                                 | 4       |
| 680      | Will                     | B                               | M                                | 2                                 | 3       |
| 681      | Willette                 | O                               | H                                | 2                                 | 4       |
| 682      | Winnebago                | B                               | M                                | 2                                 | 2       |
| 683      | Winneconne               | C                               | M                                | 2                                 | 2       |
| 684      | Winneshiek               | A                               | M                                | 2                                 | 3       |
| 685      | Winterfield              | E                               | L                                | 4                                 | 4       |
| 686      | Withee                   | D                               | M                                | 3                                 | 2       |
| 687      | Worcester                | D                               | M                                | 4                                 | 3       |
| 688      | Wormet                   | E                               | L                                | 4                                 | 4       |
| 689      | Worthen                  | B                               | L                                | 1                                 | 1       |
| 690      | Worwood                  | D                               | M                                | 4                                 | 3       |
| 691      | Wurtsmith                | E                               | L                                | 4                                 | 4       |
| 692      | Wyeville                 | C                               | M                                | 3                                 | 3       |
| 693      | Wykoff                   | D                               | L                                | 3                                 | 3       |
| 694      | Wyocena                  | A                               | M                                | 3                                 | 3       |
| 695      | Yahara                   | B                               | M                                | 3                                 | 2       |
| 696      | Zeba                     | D                               | M                                | 4                                 | 4       |
|          | Zimmerman (See Graycalm) |                                 |                                  |                                   |         |
| 697      | Zittau                   | C                               | M                                | 3                                 | 2       |
| 698      | Zurich                   | A                               | M                                | 2                                 | 2       |
| 699      | Zwingle                  | C                               | M                                | 3                                 | 3       |

<sup>a</sup> Description of subsoil groups are given in table 11.<sup>b</sup> Subsoil sulfur code: L = 5 lb/a; M = 10 lb/a; H = 20 lb/a.<sup>c</sup> Yield potential for the soil code: 1 = very high; 2 = high; 3 = medium; 4 = low.

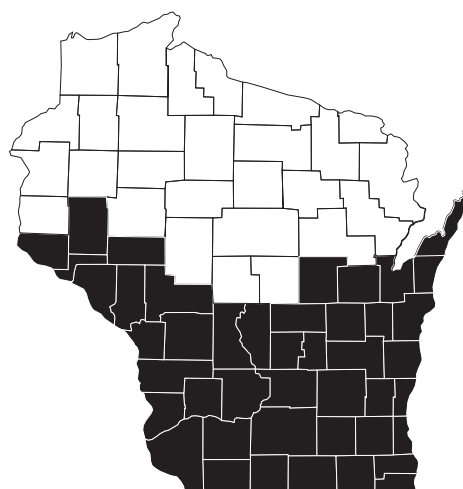


**Table 11.** Criteria for determining the appropriate subsoil group for a soil sample when the soil name is not provided with the sample

| Subsoil group | Description   | Organic matter (%) | pH   | Hues <sup>a</sup> (color) | Location (see map) |
|---------------|---|--------------------|------|---------------------------|--------------------|
| A             | Southern “forested” medium- and fine-textured soils | ≤3.0               | <7.5 | less pink                 | southern Wisconsin |
| B             | Southern “prairie” medium- and fine-textured soils  | 3.1–10.0           | <7.5 | less pink                 | southern Wisconsin |
| C             | Red medium- and fine-textured soils                 | ≤10.0              | <7.5 | more pink                 | throughout state   |
| D             | Northern medium- and fine-textured soils            | ≤10.0              | <7.5 | less pink                 | northern Wisconsin |
| E             | Sandy coarse-textured soils (sands and loamy sands) | ≤10.0              | all  | —                         | throughout state   |
| O             | Organic soils (mucks and peats)                     | >10.0              | all  | —                         | throughout state   |
| X             | High pH soils <sup>b</sup>                          | ≤10.0              | ≥7.5 | —                         | throughout state   |

<sup>a</sup> Hues are relative to Munsell color 7.5YR.

<sup>b</sup> Used only with phosphorus recommendations for non-irrigated field and fruit crops on soils with pH equal to or greater than 7.5. For all other purposes, if pH is less than 7.5, the appropriate subsoil group is used.



**Table 12.** Designated yield goals for corn and alfalfa as influenced by soil yield potential

| Yield potential code <sup>a</sup> | Relative yield potential | —Typical yields— |                      | Computer-accepted —yield goals— |                      |
|-----------------------------------|--------------------------|------------------|----------------------|---------------------------------|----------------------|
|                                   |                          | Corn<br>bu/a     | Alfalfa<br>tons/a DM | Corn<br>bu/a                    | Alfalfa<br>tons/a DM |
| 1                                 | Very high                | 140–170          | 5–7                  | 131–220                         | 3.5–8.0              |
| 2                                 | High                     | 120–140          | 4–5                  | 101–180                         | 3.0–7.0              |
| 3                                 | Medium                   | 90–120           | 3–4                  | 81–160                          | 2.5–5.5              |
| 4                                 | Low                      | 70–90            | 2–3                  | 61–140                          | 1.0–4.0              |

<sup>a</sup>Refer to table 10 for yield potential codes for specific soils.

**Table 13.** County codes and default yield potential and precipitation sulfur codes

| —County—<br>Code | Name        | Yield potential code <sup>a</sup> |                      | Sulfur in<br>precipitation<br>code <sup>c</sup> |
|------------------|-------------|-----------------------------------|----------------------|---|
|                  |             | Corn <sup>b</sup>                 | Alfalfa <sup>b</sup> |   |
| 1                | Adams       | 2                                 | 3                    | 2   |
| 2                | Ashland     | 4                                 | 3                    | 1   |
| 3                | Barron      | 3                                 | 2                    | 1   |
| 4                | Bayfield    | 4                                 | 3                    | 1   |
| 5                | Brown       | 2                                 | 1                    | 2   |
| 6                | Buffalo     | 2                                 | 2                    | 1   |
| 7                | Burnett     | 4                                 | 3                    | 1   |
| 8                | Calumet     | 2                                 | 1                    | 2   |
| 9                | Chippewa    | 3                                 | 3                    | 1   |
| 10               | Clark       | 3                                 | 2                    | 2   |
| 11               | Columbia    | 1                                 | 1                    | 2   |
| 12               | Crawford    | 2                                 | 1                    | 1   |
| 13               | Dane        | 1                                 | 1                    | 2   |
| 14               | Dodge       | 1                                 | 2                    | 2   |
| 15               | Door        | 3                                 | 3                    | 2   |
| 16               | Douglas     | 4                                 | 3                    | 1   |
| 17               | Dunn        | 2                                 | 2                    | 1   |
| 18               | Eau Claire  | 2                                 | 2                    | 1   |
| 19               | Florence    | 4                                 | 3                    | 1   |
| 20               | Fond du Lac | 2                                 | 1                    | 2   |
| 21               | Forest      | 4                                 | 3                    | 1   |
| 22               | Grant       | 2                                 | 1                    | 2   |
| 23               | Green       | 1                                 | 1                    | 2   |
| 24               | Green Lake  | 2                                 | 1                    | 2   |
| 25               | Iowa        | 2                                 | 1                    | 2   |
| 26               | Iron        | 4                                 | 3                    | 1   |
| 27               | Jackson     | 2                                 | 2                    | 1   |
| 28               | Jefferson   | 1                                 | 2                    | 2   |
| 29               | Juneau      | 2                                 | 3                    | 2   |
| 30               | Kenosha     | 2                                 | 1                    | 2   |
| 31               | Kewaunee    | 2                                 | 1                    | 2   |
| 32               | LaCrosse    | 2                                 | 2                    | 1   |
| 33               | Lafayette   | 2                                 | 1                    | 2   |
| 34               | Langlade    | 3                                 | 2                    | 1   |
| 35               | Lincoln     | 3                                 | 2                    | 1   |
| 36               | Manitowoc   | 2                                 | 1                    | 2   |
| 37               | Marathon    | 3                                 | 2                    | 2   |
| 38               | Marinette   | 3                                 | 3                    | 2   |
| 39               | Marquette   | 3                                 | 2                    | 2   |
| 40               | Menomonie   | 3                                 | 2                    | 2   |
| 41               | Milwaukee   | 2                                 | 2                    | 2   |
| 42               | Monroe      | 2                                 | 2                    | 1   |
| 43               | Oconto      | 3                                 | 2                    | 1   |
| 44               | Oneida      | 4                                 | 3                    | 1   |
| 45               | Outagamie   | 2                                 | 1                    | 2   |
| 46               | Ozaukee     | 2                                 | 1                    | 2   |
| 47               | Pepin       | 2                                 | 2                    | 1   |
| 48               | Pierce      | 2                                 | 2                    | 1   |
| 49               | Polk        | 3                                 | 2                    | 1   |
| 50               | Portage     | 2                                 | 2                    | 2   |
| 51               | Price       | 4                                 | 3                    | 1   |
| 52               | Racine      | 2                                 | 1                    | 2   |
| 53               | Richland    | 2                                 | 1                    | 1   |
| 54               | Rock        | 1                                 | 1                    | 2   |
| 55               | Rusk        | 3                                 | 2                    | 1   |
| 56               | St. Croix   | 2                                 | 2                    | 1   |
| 57               | Sauk        | 2                                 | 1                    | 2   |
| 58               | Sawyer      | 4                                 | 3                    | 1   |
| 59               | Shawano     | 3                                 | 2                    | 2   |
| 60               | Sheboygan   | 2                                 | 1                    | 2   |
| 61               | Taylor      | 3                                 | 3                    | 1   |
| 62               | Trempealeau | 2                                 | 2                    | 1   |
| 63               | Vernon      | 2                                 | 2                    | 1   |
| 64               | Vilas       | 4                                 | 3                    | 1   |
| 65               | Walworth    | 1                                 | 1                    | 2   |
| 66               | Washburn    | 4                                 | 3                    | 1   |
| 67               | Washington  | 2                                 | 1                    | 2   |
| 68               | Waukesha    | 2                                 | 1                    | 2   |
| 69               | Waupaca     | 2                                 | 2                    | 2   |
| 70               | Waushara    | 2                                 | 3                    | 2   |
| 71               | Winnebago   | 2                                 | 1                    | 2   |
| 72               | Wood        | 3                                 | 2                    | 2   |

<sup>a</sup>The relative yield potential of the soil for corn and alfalfa is coded as follows: 1 = very high; 2 = high; 3 = medium; 4 = low.

<sup>b</sup>Corn is assigned soil texture codes 2, 3, and 4; alfalfa is assigned codes 2 and 4. Soil texture codes: 1 = sandy soils; 2 = loams, silts, and clays; 3 = organic soils; 4 = red soils. All non-irrigated soils with texture code 1 are assigned a yield potential code 4 for both corn and alfalfa. Soils with texture code 3 are unsuited for growing alfalfa.

<sup>c</sup>Sulfur in precipitation code: 1 = 10 lb/a; 2 = 20 lb/a.

**Table 14.** Corn grain fertilizer recommendations for phosphate and potash

| Yield goal<br>bu/a | $P_2O_5$              |    |    | $K_2O$ |    |    |
|--------------------|-----------------------|----|----|--------|----|----|
|                    | Opt                   | H  | EH | Opt    | H  | EH |
|                    | amount to apply, lb/a |    |    |        |    |    |
| 71–90              | 30                    | 15 | 0  | 25     | 15 | 0  |
| 91–110             | 40                    | 20 | 0  | 30     | 15 | 0  |
| 111–130            | 45                    | 25 | 0  | 35     | 15 | 0  |
| 131–150            | 55                    | 25 | 0  | 40     | 20 | 0  |
| 151–170            | 60                    | 30 | 0  | 45     | 20 | 0  |
| 171–190            | 70                    | 35 | 0  | 50     | 20 | 0  |
| 191–220            | 75                    | 40 | 0  | 55     | 25 | 0  |

**Table 15.** Soybean fertilizer recommendations for phosphate and potash

| Yield goal<br>bu/a | $P_2O_5$              |    |    | $K_2O$ |    |    |    |
|--------------------|-----------------------|----|----|--------|----|----|----|
|                    | Opt                   | H  | EH | Opt    | H  | VH | EH |
|                    | amount to apply, lb/a |    |    |        |    |    |    |
| 15–25              | 20                    | 10 | 0  | 20     | 10 | 0  | 0  |
| 26–35              | 25                    | 15 | 0  | 30     | 15 | 0  | 0  |
| 36–45              | 35                    | 20 | 0  | 40     | 20 | 10 | 0  |
| 46–55              | 45                    | 20 | 0  | 50     | 25 | 10 | 0  |
| 56–65              | 50                    | 25 | 0  | 60     | 30 | 15 | 0  |
| 66–75              | 60                    | 30 | 0  | 70     | 35 | 20 | 0  |
| 76–85              | 70                    | 35 | 0  | 80     | 40 | 20 | 0  |

**Table 16.** Alfalfa, red clover, and birdsfoot trefoil fertilizer recommendations for phosphate and potash

| Yield goal<br>tons/a | $P_2O_5$              |    |    | $K_2O^a$ |     |    |    |
|----------------------|-----------------------|----|----|----------|-----|----|----|
|                      | Opt                   | H  | EH | Opt      | H   | VH | EH |
|                      | amount to apply, lb/a |    |    |          |     |    |    |
| 1.5–2.5              | 25                    | 10 | 0  | 100      | 50  | 25 | 0  |
| 2.6–3.5              | 35                    | 15 | 0  | 150      | 75  | 40 | 0  |
| 3.6–4.5              | 50                    | 25 | 0  | 200      | 100 | 50 | 0  |
| 4.6–5.5              | 65                    | 30 | 0  | 250      | 125 | 60 | 0  |
| 5.6–6.5              | 75                    | 35 | 0  | 300      | 150 | 75 | 0  |
| 6.6–7.5              | 90                    | 45 | 0  | 350      | 175 | 90 | 0  |

<sup>a</sup> If the alfalfa stand will be maintained for more than 3 years, increase topdressed potash by 20%.

**Table 17.** Field crop fertilizer recommendations for phosphate and potash

| Crop                          | Yield goal<br>per acre | P <sub>2</sub> O <sub>5</sub> |                 |    | K <sub>2</sub> O |                 |                 |    |
|-------------------------------|------------------------|-------------------------------|-----------------|----|------------------|-----------------|-----------------|----|
|                               |                        | Opt                           | H               | EH | Opt              | H               | VH              | EH |
|                               |                        | amount to apply, lb/a         |                 |    |                  |                 |                 |    |
| Alfalfa seeding               | 1–3 ton                | 25                            | 10              | 0  | 100              | 50              | 25              | 0  |
| Barley                        | 25–50 bu               | 20                            | 10              | 0  | 40               | 20              | 10              | 0  |
|                               | 51–75 bu               | 40                            | 20              | 0  | 80               | 40              | 20              | 0  |
|                               | 76–100 bu              | 60                            | 30              | 0  | 120              | 60              | 30              | 0  |
| Brassica, forage              | 2–3 ton                | 25                            | 15              | 0  | 120              | 60              | 30              | 0  |
| Buckwheat                     | 1200–2000 lb           | 20                            | 10              | 0  | 20               | 10              | 0               | 0  |
| Canola                        | 30–50 bu               | 45                            | 20              | 0  | 80               | 40              | 20              | 0  |
| Corn silage                   | 10–16 ton              | 50                            | 25              | 0  | 100              | 50              | 25              | 0  |
|                               | 16.1–20 ton            | 65                            | 30              | 0  | 120              | 60              | 30              | 0  |
|                               | 20.1–25 ton            | 85                            | 40              | 0  | 135              | 70              | 35              | 0  |
|                               | 25.1–35 ton            | 100                           | 50              | 0  | 150              | 75              | 40              | 0  |
| Flax                          | 20–40 bu               | 20                            | 10              | 0  | 20               | 10              | 0               | 0  |
| Lupin                         | 40–60 bu               | 50                            | 25              | 0  | 60               | 30              | 15              | 0  |
| Millet                        | 40–60 bu               | 20                            | 10              | 0  | 20               | 10              | 0               | 0  |
| Oat                           | 30–60 bu               | 20                            | 10              | 0  | 60               | 30              | 15              | 0  |
|                               | 61–90 bu               | 30                            | 15              | 0  | 90               | 45              | 25              | 0  |
|                               | 91–120 bu              | 40                            | 20              | 0  | 120              | 60              | 30              | 0  |
| Oatlage                       | 2–3.5 ton              | 30                            | 15              | 0  | 120              | 60              | 30              | 0  |
| Oat-pea forage                | 2–3.5 ton              | 30                            | 15              | 0  | 120              | 60              | 30              | 0  |
| Pasture, unimproved           | 1–2 ton                | 25                            | 15              | 0  | 60               | 30              | 15              | 0  |
|                               | 2.1–3 ton              | 40                            | 20              | 0  | 90               | 45              | 25              | 0  |
|                               | 3.1–4 ton              | 50                            | 25              | 0  | 120              | 60              | 30              | 0  |
| Pasture, managed <sup>b</sup> | 2–3 ton                | 30                            | 15              | 0  | 110              | 55              | 25              | 0  |
|                               | 3.1–4 ton              | 40                            | 20              | 0  | 160              | 80              | 40              | 0  |
|                               | 4.1–5 ton              | 50                            | 25              | 0  | 200              | 100             | 50              | 0  |
| Pasture, legume-grass         | 2–3 ton                | 30                            | 15              | 0  | 120              | 60              | 30              | 0  |
|                               | 3.1–4 ton              | 45                            | 20              | 0  | 180              | 90              | 45              | 0  |
|                               | 4.1–5 ton              | 60                            | 30              | 0  | 240              | 120             | 60              | 0  |
| Pea (chick, field, cow)       | 1–2 ton                | 30                            | 15              | 0  | 90               | 45              | 20              | 0  |
| Reed canarygrass              | 4–7 ton                | 40                            | 20              | 0  | 180              | 90              | 45              | 0  |
| Rye                           | 15–30 bu               | 20                            | 10              | 0  | 40               | 20              | 10              | 0  |
|                               | 31–50 bu               | 30                            | 15              | 0  | 60               | 30              | 15              | 0  |
|                               | 51–70 bu               | 40                            | 20              | 0  | 80               | 40              | 20              | 0  |
| Sod                           | —                      | 20 <sup>a</sup>               | 10 <sup>a</sup> | 0  | 60 <sup>a</sup>  | 30 <sup>a</sup> | 15 <sup>a</sup> | 0  |
| Sorghum, grain                | 50–100 bu              | 30                            | 15              | 0  | 30               | 15              | 10              | 0  |
| Sorghum-sudan forage          | 5–7 ton                | 40                            | 20              | 0  | 180              | 90              | 45              | 0  |
| Sunflower                     | 500–1200 lb            | 10                            | 5               | 0  | 20               | 10              | 0               | 0  |
|                               | 1201–2500 lb           | 15                            | 10              | 0  | 30               | 15              | 10              | 0  |
|                               | 2501–4000 lb           | 20                            | 10              | 0  | 40               | 20              | 10              | 0  |
| Tobacco                       | 1600–2000 lb           | 15                            | 10              | 0  | 100              | 50              | 25              | 0  |
|                               | 2001–2400 lb           | 20                            | 10              | 0  | 125              | 65              | 30              | 0  |
|                               | 2401–2800 lb           | 25                            | 15              | 0  | 150              | 75              | 40              | 0  |
| Triticale                     | 2500–4000 lb           | 35                            | 15              | 0  | 30               | 15              | 10              | 0  |
| Vetch (crown, hairy)          | 2–3 ton                | 40                            | 20              | 0  | 120              | 60              | 30              | 0  |
| Wheat                         | 20–40 bu               | 20                            | 10              | 0  | 40               | 20              | 10              | 0  |
|                               | 41–60 bu               | 35                            | 20              | 0  | 70               | 35              | 20              | 0  |
|                               | 61–90 bu               | 60                            | 30              | 0  | 100              | 50              | 25              | 0  |
| CRP, alfalfa                  |                        | 0                             | 0               | 0  | 0                | 0               | 0               | 0  |
| CRP, red clover               |                        | 0                             | 0               | 0  | 0                | 0               | 0               | 0  |
| CRP, grass                    |                        | 0                             | 0               | 0  | 0                | 0               | 0               | 0  |

<sup>a</sup>Most P<sub>2</sub>O<sub>5</sub> and K<sub>2</sub>O should be incorporated prior to seeding. <sup>b</sup>Includes brome grass, fescue, orchard grass, ryegrass, and timothy.

**Table 18.** Vegetable and fruit crop fertilizer recommendations for phosphate and potash

| Crop                     | Yield goal<br>per acre | P <sub>2</sub> O <sub>5</sub> |    |    | K <sub>2</sub> O |     |    |    |
|--------------------------|------------------------|-------------------------------|----|----|------------------|-----|----|----|
|                          |                        | Opt                           | H  | EH | Opt              | H   | VH | EH |
|                          |                        | amount to apply, lb/a         |    |    |                  |     |    |    |
| Asparagus                | 2000–4000 lb           | 10                            | 5  | 0  | 20               | 10  | 0  | 0  |
| Bean, dry (kidney, navy) | 10–20 bu               | 15                            | 10 | 0  | 20               | 10  | 0  | 0  |
|                          | 21–30 bu               | 20                            | 10 | 0  | 40               | 20  | 10 | 0  |
|                          | 31–40 bu               | 30                            | 15 | 0  | 60               | 30  | 15 | 0  |
| Bean, lima               | 2000–3000 lb           | 20                            | 10 | 0  | 40               | 20  | 10 | 0  |
|                          | 3001–4000 lb           | 30                            | 15 | 0  | 60               | 30  | 15 | 0  |
|                          | 4001–5000 lb           | 40                            | 20 | 0  | 80               | 40  | 20 | 0  |
| Beet, table              | 5–10 ton               | 10                            | 5  | 0  | 60               | 30  | 15 | 0  |
|                          | 10.1–15 ton            | 15                            | 10 | 0  | 90               | 45  | 20 | 0  |
|                          | 15.1–20 ton            | 20                            | 10 | 0  | 120              | 60  | 30 | 0  |
| Broccoli                 | 4–6 ton                | 10                            | 5  | 0  | 20               | 10  | 0  | 0  |
| Brussels sprout          | 4–6 ton                | 30                            | 15 | 0  | 120              | 60  | 30 | 0  |
| Cabbage                  | 8–12 ton               | 15                            | 10 | 0  | 70               | 40  | 20 | 0  |
|                          | 12.1–20 ton            | 25                            | 15 | 0  | 120              | 60  | 30 | 0  |
|                          | 20.1–30 ton            | 40                            | 20 | 0  | 180              | 90  | 45 | 0  |
| Carrot                   | 20–30 ton              | 45                            | 20 | 0  | 240              | 120 | 60 | 0  |
| Cauliflower              | 6–8 ton                | 20                            | 10 | 0  | 50               | 25  | 10 | 0  |
| Celery                   | 25–35 ton              | 100                           | 50 | 0  | 300              | 150 | 75 | 0  |
| Corn, sweet              | 2–4 ton                | 10                            | 5  | 0  | 20               | 10  | 0  | 0  |
|                          | 4.1–6 ton              | 15                            | 10 | 0  | 30               | 15  | 10 | 0  |
|                          | 6.1–9 ton              | 25                            | 15 | 0  | 40               | 20  | 10 | 0  |
| Cucumber                 | 300–400 bu             | 10                            | 5  | 0  | 30               | 15  | 10 | 0  |
| Ginseng                  | 1000–3000 lb           | 15                            | 10 | 0  | 60               | 30  | 15 | 0  |
| Lettuce                  | 15–20 ton              | 40                            | 20 | 0  | 160              | 80  | 40 | 0  |
| Melon                    | 8–10 ton               | 40                            | 20 | 0  | 140              | 70  | 35 | 0  |
| Mint, oil                | 35–55 lb (oil)         | 50                            | 25 | 0  | 200              | 100 | 50 | 0  |
| Onion                    | 400–600 cwt            | 60                            | 30 | 0  | 130              | 65  | 30 | 0  |
| Pea, canning             | 1000–2500 lb           | 10                            | 5  | 0  | 20               | 10  | 0  | 0  |
|                          | 2501–4000 lb           | 15                            | 10 | 0  | 30               | 15  | 10 | 0  |
|                          | 4001–6000 lb           | 20                            | 10 | 0  | 40               | 20  | 10 | 0  |
| Pepper                   | 8–10 ton               | 10                            | 5  | 0  | 50               | 25  | 10 | 0  |
| Popcorn                  | 60–80 bu               | 25                            | 15 | 0  | 20               | 10  | 0  | 0  |
| Potato                   | 250–350 cwt            | 35                            | 20 | 0  | 150              | 75  | 35 | 0  |
|                          | 351–450 cwt            | 50                            | 25 | 0  | 200              | 100 | 50 | 0  |
|                          | 451–600 cwt            | 65                            | 30 | 0  | 260              | 130 | 65 | 0  |
| Pumpkin                  | 15–20 ton              | 50                            | 25 | 0  | 110              | 60  | 30 | 0  |
| Snapbean                 | 3000–5000 lb           | 10                            | 5  | 0  | 20               | 10  | 0  | 0  |
|                          | 5001–7000 lb           | 15                            | 10 | 0  | 30               | 15  | 10 | 0  |
|                          | 7001–9000 lb           | 20                            | 10 | 0  | 40               | 20  | 10 | 0  |
| Spinach                  | 4–6 ton                | 20                            | 10 | 0  | 50               | 25  | 10 | 0  |
| Squash                   | 12–16 ton              | 40                            | 20 | 0  | 90               | 45  | 25 | 0  |
| Tomato                   | 20–25 ton              | 40                            | 20 | 0  | 180              | 90  | 45 | 0  |
| Truck crops              | —                      | 40                            | 20 | 0  | 120              | 60  | 30 | 0  |
| Apple                    |                        | 50                            | 25 | 0  | 100              | 50  | 25 | 0  |
| Blueberry                |                        | 50                            | 25 | 0  | 100              | 50  | 25 | 0  |
| Cherry                   |                        | 50                            | 25 | 0  | 100              | 50  | 25 | 0  |
| Cranberry                |                        | 50                            | 25 | 0  | 100              | 50  | 25 | 0  |
| Raspberry                |                        | 50                            | 25 | 0  | 100              | 50  | 25 | 0  |
| Strawberry               |                        | 50                            | 25 | 0  | 100              | 50  | 25 | 0  |



**Table 19.** Additional phosphate and potash required for soils testing in the low (L) or very low (VL) categories for the various demand levels to be added to the amount recommended for soils testing in the optimum (Opt) category.

| Subsoil<br>fertility<br>group  | $P_2O_5$        |                | $K_2O$          |                |
|--|-----------------|----------------|-----------------|----------------|
|  | VL <sup>a</sup> | L <sup>b</sup> | VL <sup>a</sup> | L <sup>b</sup> |
| lb/a   |                 |                |                 |                |
| <b>Demand level 1 (corn)</b>   |                 |                |                 |                |
| A  | 30              | 20             | 40              | 30             |
| B  | 30              | 20             | 40              | 30             |
| C  | 30              | 20             | 55              | 40             |
| D  | 30              | 20             | 40              | 30             |
| E  | 40              | 30             | 25              | 15             |
| O  | 60              | 40             | 25              | 15             |
| X  | 30              | 20             | —               | —              |
| <b>Demand level 2 (soybean and low-demand field crops)</b>                             |                 |                |                 |                |
| A  | —               | 10             | 40              | 30             |
| B  | —               | 10             | 40              | 30             |
| C  | —               | 10             | 55              | 40             |
| D  | —               | 10             | 40              | 30             |
| E  | —               | 10             | —               | 15             |
| O  | —               | 10             | —               | 15             |
| X  | —               | 10             | —               | —              |
| <b>Demand level 3 (alfalfa, irrigated field crops, and low-demand vegetable crops)</b> |                 |                |                 |                |
| A  | 40              | 30             | 40              | 30             |
| B  | 40              | 30             | 40              | 30             |
| C  | 40              | 30             | 50              | 35             |
| D  | 30              | 20             | 40              | 30             |
| E  | 30              | 20             | 35              | 25             |
| O  | 50              | 40             | 35              | 25             |
| X  | 30              | 20             | —               | —              |
| <b>Demand level 4 (red clover and medium-demand field crops)</b>                       |                 |                |                 |                |
| A  | 30              | 20             | 35              | 30             |
| B  | 30              | 20             | 35              | 30             |
| C  | 30              | 20             | 40              | 30             |
| D  | 30              | 20             | 40              | 30             |
| E  | 30              | 20             | 25              | 15             |
| O  | 40              | 30             | 25              | 15             |
| X  | 30              | 20             | —               | —              |
| <b>Demand level 5 (high-demand vegetable crops)</b>                                    |                 |                |                 |                |
| A  | 80              | 60             | 125             | 85             |
| B  | 80              | 60             | 125             | 85             |
| C  | 80              | 60             | 170             | 105            |
| D  | 80              | 60             | 125             | 85             |
| E  | 60              | 50             | 75              | 50             |
| O  | 90              | 70             | 75              | 50             |
| X  | 80              | 60             | —               | —              |
| <b>Demand level 6 (potato)</b>   |                 |                |                 |                |
| A  | 200             | 120            | 85              | 55             |
| B  | 200             | 120            | 85              | 55             |
| C  | 200             | 120            | 105             | 75             |
| D  | 200             | 120            | 90              | 65             |
| E  | 85              | 60             | 50              | 35             |
| O  | 170             | 120            | 50              | 35             |
| X  | 120             | 70             | —               | —              |

<sup>a</sup>This is the amount of  $P_2O_5$  or  $K_2O$  that must be added in each of about 8 years to increase the soil test from the top of the very low range to the midpoint of the optimum range.

<sup>b</sup>This is the amount of  $P_2O_5$  or  $K_2O$  that must be added in each of about 8 years to increase the soil test from the midpoint of the low range to the midpoint of the optimum range.

**Table 20.** Nitrogen recommendations for corn and corn silage

| Soil organic matter % | Sands/loamy sands <sup>a</sup> |               | Other soils  |  |
|-----------------------|--------------------------------|---------------|--|--|
|                       | Irrigated                      | Non-irrigated | Medium/low yield potential <sup>b</sup><br>(code 3 or 4) | Very high/high yield potential <sup>c</sup><br>(code 1 or 2) |
|                       | (lb N/a)                       |               |  |  |
| < 2                   | 200                            | 120           | 150  | 180  |
| 2–9.9                 | 160                            | 110           | 120  | 160  |
| 10–20                 | 120                            | 100           | 90   | 120  |
| > 20                  | 80                             | 80            | 80   | 80   |

<sup>a</sup>Subsoil group E or texture code 1.

<sup>b</sup>Default recommendation for northern Wisconsin soils.

<sup>c</sup>Yield potential 1 includes all irrigated non-sandy soils. Default recommendation for southern Wisconsin soils.

**Table 21.** Nitrogen recommendations for potatoes

| Yield goal<br>cwt/a | Soil organic matter content (%)    |       |       |     |
|---------------------|------------------------------------|-------|-------|-----|
|                     | <2                                 | 2–9.9 | 10–20 | >20 |
|                     | amount to apply, lb/a <sup>a</sup> |       |       |     |
| 250–350             | 115                                | 90    | 70    | 30  |
| 351–450             | 150                                | 125   | 100   | 45  |
| 451–600             | 200                                | 150   | 125   | 60  |

<sup>a</sup>These amounts assume some additional nitrogen (~30 lb/a) was applied as starter fertilizer. Reduce nitrogen rate by 25% if petiole nitrogen test is used to guide in-season nitrogen applications.

**Table 22.** Nitrogen recommendations for crops other than corn and potatoes.

| Crop                          | Yield goal<br>per acre | Soil organic matter content (%)   |                  |                  |                 |
|-------------------------------|------------------------|-----------------------------------|------------------|------------------|-----------------|
|                               |                        | <2                                | 2-9.9            | 10-20            | >20             |
|                               |                        | amount of nitrogen to apply, lb/a |                  |                  |                 |
| Alfalfa                       | 3–8 ton                | 0                                 | 0                | 0                | 0               |
| Alfalfa seeding               | 1–3 ton                | 30 <sup>a</sup>                   | 0                | 0                | 0               |
| Asparagus                     | 2000–4000 lb           | 80                                | 60               | 40               | 20              |
| Barley                        | 50–100 bu              | 70 <sup>b</sup>                   | 50 <sup>b</sup>  | 30 <sup>b</sup>  | 15 <sup>b</sup> |
| Bean, dry (kidney, navy)      | 20–40 bu               | 40                                | 30               | 20               | 10              |
| Bean, lima                    | 3000–5000 lb           | 60                                | 40               | 20               | 10              |
| Beet, table                   | 10–20 ton              | 120                               | 100              | 80               | 30              |
| Brassica, forage              | 2–3 ton                | 120                               | 100              | 80               | 40              |
| Broccoli                      | 4–6 ton                | 100                               | 80               | 60               | 25              |
| Brussels sprout               | 4–6 ton                | 100                               | 80               | 60               | 25              |
| Buckwheat                     | 1200–2000 lb           | 50                                | 30               | 20               | 0               |
| Cabbage                       | 12–30 ton              | 180                               | 140              | 100              | 40              |
| Canola                        | 30–50 bu               | 80                                | 60               | 40               | 20              |
| Carrot                        | 20–30 ton              | 120                               | 100              | 80               | 40              |
| Cauliflower                   | 6–8 ton                | 120                               | 100              | 80               | 40              |
| Celery                        | 25–35 ton              | 140                               | 120              | 100              | 50              |
| Corn, sweet                   | 4–9 ton                | 150                               | 130              | 110              | 70              |
| Cucumber                      | 300–400 bu             | 100                               | 80               | 60               | 30              |
| Flax                          | 20–40 bu               | 50                                | 30               | 20               | 0               |
| Ginseng                       | 1000–3000 lb           | 60                                | 40               | 20               | 0               |
| Lettuce                       | 15–20 ton              | 120                               | 100              | 80               | 40              |
| Lupin                         | 40–60 bu               | 10                                | 0                | 0                | 0               |
| Melon                         | 8–10 ton               | 100                               | 80               | 60               | 30              |
| Millet                        | 40–60 bu               | 80                                | 60               | 40               | 20              |
| Mint, oil                     | 35–55 lb (oil)         | 120                               | 100              | 80               | 50              |
| Oat                           | 60–120 bu              | 60 <sup>b</sup>                   | 40 <sup>b</sup>  | 20 <sup>b</sup>  | 0               |
| Oatlage <sup>h</sup>          | 2–3.5 ton              | 30                                | 20               | 10               | 0               |
| Oat-pea forage <sup>h</sup>   | 2–3.5 ton              | 25                                | 15               | 0                | 0               |
| Onion                         | 400–600 cwt            | 150                               | 140              | 130              | 120             |
| Pasture, unimproved           | 2–4 ton                | 120 <sup>c</sup>                  | 100 <sup>c</sup> | 70 <sup>c</sup>  | 30 <sup>c</sup> |
| Pasture, managed <sup>g</sup> | 3–5 ton                | 160 <sup>c</sup>                  | 130 <sup>c</sup> | 100 <sup>c</sup> | 50 <sup>c</sup> |
| Pasture, legume-grass         | 3–5 ton                | 40 <sup>a</sup>                   | 20 <sup>a</sup>  | 0                | 0               |
| Pea, canning                  | 2500–6000 lb           | 40                                | 30               | 20               | 0               |
| Pea, chick, field, cow        | 1–2 ton                | 40                                | 30               | 20               | 0               |
| Pepper                        | 8–10 ton               | 100                               | 80               | 60               | 30              |
| Popcorn                       | 60–80 bu               | 110                               | 90               | 70               | 50              |
| Pumpkin                       | 15–20 ton              | 100                               | 80               | 60               | 30              |
| Red clover                    | 1.5–5.5 ton            | 30 <sup>a</sup>                   | 0                | 0                | 0               |
| Reed canarygrass              | 4–7 ton                | 270                               | 250              | 220              | 100             |
| Rye                           | 30–70 bu               | 60                                | 40               | 20               | 0               |
| Snapbean                      | 5000–9000 lb           | 60                                | 40               | 20               | 0               |
| Sod                           | —                      | 80 <sup>d</sup>                   | 60 <sup>d</sup>  | 40 <sup>d</sup>  | 40 <sup>d</sup> |
| Sorghum, grain                | 50–100 bu              | 130                               | 100              | 80               | 40              |
| Sorghum-sudan forage          | 5–7 ton                | 120                               | 100              | 80               | 40              |

**Table 22.** (continued)

| Crop                    | Yield goal<br>per acre | Soil organic matter content (%)   |                 |                 |     |
|-------------------------|------------------------|-----------------------------------|-----------------|-----------------|-----|
|                         |                        | <2                                | 2–9.9           | 10–20           | >20 |
|                         |                        | amount of nitrogen to apply, lb/a |                 |                 |     |
| Soybean                 | 15–85 bu               | 0                                 | 0               | 0               | 0   |
| Spinach                 | 4–6 ton                | 100                               | 80              | 60              | 30  |
| Squash                  | 12–16 ton              | 80                                | 60              | 40              | 20  |
| Sunflower               | 1200–4000 lb           | 100                               | 80              | 60              | 30  |
| Tobacco                 | 2000–2800 lb           | 140                               | 120             | 100             | 50  |
| Tomato                  | 20–25 ton              | 140                               | 120             | 100             | 50  |
| Trefoil, birdsfoot      | 1.5–5.5 ton            | 30 <sup>a</sup>                   | 0               | 0               | 0   |
| Triticale               | 2500–4000 lb           | 60                                | 40              | 20              | 0   |
| Truck crops             | —                      | 140                               | 120             | 120             | 60  |
| Vetch (crown, hairy)    | 2–3 ton                | 30 <sup>a</sup>                   | 0               | 0               | 0   |
| Wheat                   | 40–90 bu               | 80 <sup>e</sup>                   | 60 <sup>e</sup> | 40 <sup>e</sup> | 0   |
| Apple <sup>f</sup>      |                        | —                                 | —               | —               | —   |
| Blueberry <sup>f</sup>  |                        | —                                 | —               | —               | —   |
| Cherry <sup>f</sup>     |                        | —                                 | —               | —               | —   |
| Cranberry <sup>f</sup>  |                        | —                                 | —               | —               | —   |
| Raspberry <sup>f</sup>  |                        | —                                 | —               | —               | —   |
| Strawberry <sup>f</sup> |                        | —                                 | —               | —               | —   |
| CRP, alfalfa            | —                      | 20 <sup>a</sup>                   | 0               | 0               | 0   |
| CRP, red clover         | —                      | 20 <sup>a</sup>                   | 0               | 0               | 0   |
| CRP, grass              | —                      | 30 <sup>a</sup>                   | 15              | 0               | 0   |

<sup>a</sup>For direct-seeded alfalfa, red clover, birdsfoot trefoil, and legume pasture on low organic matter soils, some nitrogen (20–30 lb N/a) should be applied prior to seeding.

<sup>b</sup>Where barley or oats are underseeded with a legume forage, eliminate or reduce nitrogen by 50%.

<sup>c</sup>Nitrogen applications should be split into 2–3 applications per year.

<sup>d</sup>Apply after seedling emergence. Some nitrogen may be used 2 weeks before harvest to darken color.

<sup>e</sup>Reduce nitrogen rate by 10 lb/a for spring wheat.

<sup>f</sup>Nitrogen recommendations are based on results of plant analyses.

<sup>g</sup>Includes brome grass, fescue, orchard grass, ryegrass, and timothy.

<sup>h</sup>Assumes alfalfa underseeding.

**Table 23.** Estimate of available nutrients from solid or liquid manure for several species, management systems and years of consecutive application.

| Species                                   | Solid                             |      |  |                              |        | Liquid               |      |   |                              |        |
|---|-----------------------------------|------|--|------------------------------|--------|----------------------|------|---|------------------------------|--------|
|   | Nitrogen<br>Not inc. <sup>a</sup> | Inc. | Phosphate<br>(P <sub>2</sub> O <sub>5</sub> )<br>lb/ton <sup>b</sup> | Potash<br>(K <sub>2</sub> O) | Sulfur | Nitrogen<br>Not inc. | Inc. | Phosphate<br>(P <sub>2</sub> O <sub>5</sub> )<br>lb/1000 gal <sup>b</sup> | Potash<br>(K <sub>2</sub> O) | Sulfur |
| <b>One year of application</b>            |                                   |      |  |                              |        |                      |      |   |                              |        |
| Dairy                                     | 3                                 | 4    | 3  | 8                            | 0.8    | 8                    | 10   | 8   | 21                           | 2.3    |
| Beef                                      | 4                                 | 4    | 5  | 8                            | 0.9    | 10                   | 12   | 14  | 23                           | 2.6    |
| Swine                                     |                                   |      |  |                              |        |                      |      |   |                              |        |
| finish <sup>c</sup>                       | 4                                 | 5    | 3  | 7                            | 1.5    | 22                   | 28   | 15  | 26                           | 4.2    |
| farrow                                    | —                                 | —    | —  | —                            | —      | 12                   | 15   | 6   | 8                            | 2.2    |
| Poultry                                   | 13                                | 15   | 14   | 9                            | 1.8    | 35                   | 41   | 38  | 25                           | 5.0    |
| Veal                                      | —                                 | —    | —  | —                            | —      | 12                   | 14   | 14  | 38                           | 2.5    |
| <b>Two years of application</b>           |                                   |      |  |                              |        |                      |      |   |                              |        |
| Dairy                                     | 4                                 | 5    | 3  | 9                            | 1.0    | 11                   | 13   | 9   | 24                           | 2.7    |
| Beef                                      | 5                                 | 6    | 6  | 9                            | 1.1    | 14                   | 16   | 16  | 26                           | 3.1    |
| Swine                                     |                                   |      |  |                              |        |                      |      |   |                              |        |
| finish                                    | 5                                 | 6    | 4  | 8                            | 1.7    | 28                   | 33   | 18  | 29                           | 4.9    |
| farrow                                    | —                                 | —    | —  | —                            | —      | 15                   | 18   | 7   | 9                            | 2.6    |
| Poultry                                   | 15                                | 18   | 16   | 10                           | 2.1    | 42                   | 48   | 45  | 28                           | 5.8    |
| Veal                                      | —                                 | —    | —  | —                            | —      | 14                   | 17   | 16  | 43                           | 3.0    |
| <b>Three or more years of application</b> |                                   |      |  |                              |        |                      |      |   |                              |        |
| Dairy                                     | 5                                 | 5    | 4  | 9                            | 1.0    | 13                   | 14   | 10  | 25                           | 2.9    |
| Beef                                      | 6                                 | 6    | 6  | 10                           | 1.2    | 16                   | 18   | 17  | 28                           | 3.4    |
| Swine                                     |                                   |      |  |                              |        |                      |      |   |                              |        |
| finish                                    | 6                                 | 7    | 4  | 8                            | 1.9    | 30                   | 36   | 19  | 31                           | 5.3    |
| farrow                                    | —                                 | —    | —  | —                            | —      | 17                   | 20   | 8   | 9                            | 2.8    |
| Poultry                                   | 16                                | 19   | 18   | 11                           | 2.2    | 45                   | 52   | 48  | 30                           | 6.3    |
| Veal                                      | —                                 | —    | —  | —                            | —      | 16                   | 18   | 17  | 46                           | 3.3    |

<sup>a</sup>Inc. = incorporated<sup>b</sup>Rounded to nearest whole pound.<sup>c</sup>All solid swine manure considered as from finishing units.



**Table 24.** Estimate of second- and third-year nutrients available from solid or liquid manure for several species, management systems, and years of consecutive application.

| Species   | Solid  |                               |                  |     | Liquid      |                               |                  |     |
|---|--------|-------------------------------|------------------|-----|-------------|-------------------------------|------------------|-----|
|   | N      | P <sub>2</sub> O <sub>5</sub> | K <sub>2</sub> O | S   | N           | P <sub>2</sub> O <sub>5</sub> | K <sub>2</sub> O | S   |
|   | lb/ton |                               |                  |     | lb/1000 gal |                               |                  |     |
| Second-year credits                               |        |                               |                  |     |             |                               |                  |     |
| Two or three years consecutive application:       |        |                               |                  |     |             |                               |                  |     |
| Dairy   | 1.5    | 0.6                           | 1.5              | 0.1 | 4.2         | 2.1                           | 4.2              | 0.6 |
| Beef  | 2.1    | 1.3                           | 1.6              | 0.3 | 5.8         | 3.7                           | 4.6              | 0.7 |
| Swine   |        |                               |                  |     |             |                               |                  |     |
| finish  | 1.5    | 0.9                           | 1.3              | 0.4 | 8.2         | 4.0                           | 5.1              | 1.2 |
| farrow  | —      | —                             | —                | —   | 4.5         | 1.5                           | 1.5              | 0.6 |
| Poultry   | 3.7    | 3.7                           | 1.8              | 0.5 | 10.3        | 10.3                          | 4.9              | 1.4 |
| Veal  | —      | —                             | —                | —   | 3.6         | 3.7                           | 7.6              | 0.6 |
| One year consecutive application:                 |        |                               |                  |     |             |                               |                  |     |
| Dairy   | 1.0    | 0.5                           | 1.0              | 0.1 | 2.8         | 1.4                           | 2.8              | 0.4 |
| Beef  | 1.4    | 0.9                           | 1.1              | 0.2 | 3.9         | 2.5                           | 3.1              | 0.5 |
| Swine   |        |                               |                  |     |             |                               |                  |     |
| finish  | 1.0    | 0.6                           | 0.9              | 0.3 | 5.5         | 2.7                           | 3.4              | 0.8 |
| farrow  | —      | —                             | —                | —   | 3.0         | 1.0                           | 1.0              | 0.4 |
| Poultry   | 2.5    | 2.5                           | 1.2              | 0.3 | 6.9         | 6.9                           | 3.3              | 0.9 |
| Veal  | —      | —                             | —                | —   | 2.4         | 2.5                           | 5.1              | 0.4 |
| Third-year credits                                |        |                               |                  |     |             |                               |                  |     |
| One, two, or three years consecutive application: |        |                               |                  |     |             |                               |                  |     |
| Dairy   | 0.5    | 0.2                           | 0.5              | 0   | 1.4         | 0.7                           | 1.4              | 0.2 |
| Beef  | 0.7    | 0.4                           | 0.5              | 0.1 | 1.9         | 1.2                           | 1.5              | 0.2 |
| Swine   |        |                               |                  |     |             |                               |                  |     |
| finish  | 0.5    | 0.3                           | 0.4              | 0.1 | 2.7         | 1.3                           | 1.7              | 0.4 |
| farrow  | —      | —                             | —                | —   | 1.5         | 0.5                           | 0.5              | 0.2 |
| Poultry   | 1.2    | 1.2                           | 0.6              | 0.2 | 3.4         | 3.4                           | 1.6              | 0.5 |
| Veal  | —      | —                             | —                | —   | 1.2         | 1.2                           | 2.5              | 0.2 |

**Table 25.** Legume nitrogen credits

| Crop   | Regrowth on sandy soils |           | Regrowth on other soils |           |
|--|-------------------------|-----------|-------------------------|-----------|
|  | <8 inches               | >8 inches | <8 inches               | >8 inches |
|  | —lb/a—                  |           |                         |           |
| Alfalfa <sup>a</sup>                                     |                         |           |                         |           |
| good stand (> 70%)                                       | 100                     | 140       | 150                     | 190       |
| fair stand (30–70%)                                      | 70                      | 110       | 120                     | 160       |
| poor stand (< 30%)                                       | 40                      | 80        | 90                      | 130       |
| Alfalfa seeding  | —                       | 60        | —                       | 100       |
| Red clover or birdsfoot trefoil                          |                         |           |                         |           |
| good stand (> 70%)                                       | 80                      | 110       | 120                     | 150       |
| fair stand (30–70%)                                      | 50                      | 90        | 90                      | 130       |
| poor stand (< 30%)                                       | 30                      | 60        | 70                      | 100       |
| Soybean  | —                       | 0         | —                       | 40        |
| Leguminous vegetables<br>(Snapbean, pea, lima, dry bean) | —                       | 0         | —                       | 20        |
| Vetch  | 40                      | 110       | 90                      | 160       |

<sup>a</sup>For second-year a 50 lb credit is given on non-sandy soils if the stand is fair or good.

**Table 26.** Suggested treatments for sulfur deficiencies.

| <b>Crop</b>                                   | <b>Sulfur needed</b> |
|---|----------------------|
|   | —lb/a—               |
| Forage legumes                                |                      |
| Incorporated at seeding                       | 25–50                |
| Topdressed on established stand               | 15–25                |
| Corn, small grains, vegetable and fruit crops | 10–25                |

**Table 27.** Copper fertilizer recommendations<sup>a</sup>.

| <b>Crop</b>  | <b>Sands</b>                                     | <b>Loams, silts, clays</b>                       | <b>Organic</b>                                   |
|--|--|--|--|
|  | <b>Bdct<sup>b</sup></b><br>—lb/a—<br><b>Band</b> | <b>Bdct<sup>b</sup></b><br>—lb/a—<br><b>Band</b> | <b>Bdct<sup>b</sup></b><br>—lb/a—<br><b>Band</b> |
| Lettuce, onion, spinach  | 10   | 12   | 13   |
| Carrot, cauliflower, celery,<br>alfalfa, clover, corn, oat,<br>radish, sudan grass, wheat            | 4  | 8  | 12   |
| Asparagus, barley, bean,<br>beet, broccoli, cabbage,<br>cucumber, mint, pea, potato,<br>rye, soybean | 0  | 0  | 2  |

<sup>a</sup>Recommendations are for inorganic sources of copper. Copper chelates can also be used at 1/6 of the rates recommended above. Do not apply copper unless a deficiency has been verified by plant analysis.

<sup>b</sup>Bdct = broadcast



## 1997 Wisconsin soil test program logic sequence

The general logic sequence that is followed for making the computerized soil test recommendations is shown below. Many of the specific details have been omitted; however, the general flow and factors that influence the recommendations are given.

### Sample origin

**Step 1.** If sample is from out of state and no soil name is given or soil name is not recognized as a Wisconsin soil, provide only analytical results and no interpretation (print comment 1).

**Step 2.** If sample is from Wisconsin or out of state with recognizable soil name then proceed to remainder of program.

### Phosphorus and potassium recommendations

**Step 1.** Determine crop demand level for each crop listed.

- Assign demand level based on crop or, if crops not indicated, assign corn, oats, and alfalfa.
- If irrigated and not demand level 5 or 6, assign to demand level 3 (print comment 29).
- If demand level 5 or 6 print statement on frequent retesting (comment 30).
- Print statements for specific crop codes (comment 9 or 12) if appropriate.

**Step 2.** Determine subsoil fertility group (SSG).

- Consider soil name.
- Use criteria in table 11 if name not given. Print comment 12.
- If alfalfa, apple or cherry indicated and SSG is O print comment about unsuitability (comment 32 or 33).
- If SSG is E or O, print statement about retesting soil every 2 years (comment 31).

**Step 3.** Determine P and K interpretation considering demand level, subsoil group, and soil test and graphically display on report.

**Step 4.** Determine nutrient need from interpretative level and yield goal.

- If yield goal is outside acceptable range, reassign and print comment 34.
- If corn is listed, and P and/or K soil test are not excessively high, print appropriate statement about additional P and/or K replacement need for silage harvest (comment 5, 8, or 42).

**Step 5.** Subtract P and K fertilizer replacement credit if manure applied and print conditions with excessively high tests (comment 21 or 10).

### Lime recommendations

**Step 1.** Determine target pH for each crop listed. Print comment 41 if appropriate.

**Step 2.** Select most lime-demanding crop and calculate lime need for that target pH lime for 60-69 and 80-89 grade aglime.

- If pH is less than 0.2 pH units from target pH, lime recommendation is 0.
- For all crops except potatoes, if lime need exceeds 12 tons/a, round to 12 tons/a and print comment 26.
- Where potatoes are indicated and LR is less than 8 tons/a, limit lime to the amount needed for potatoes, calculate and print LR for scab-susceptible potatoes, and print comment 44.
- Where potatoes are indicated and LR is greater than 8 tons/a, round to 8 tons/a, print comments 26 and 44, and print LR for scab-susceptible potatoes.

**Step 3.** Print graph for lime interpretation for most lime-demanding crop.

### Nitrogen recommendations

**Step 1.** If crop is not corn or potatoes, determine base N recommendation based on crop and organic matter level.

**Step 2.** For corn,

- If soil name given, use soil yield potential, texture, and irrigation status to assign base N level. Adjust for organic matter.
- Where soil name not given assign yield potential based on county.

**Step 3.** If potatoes, consider yield goal and adjust for organic matter.

**Step 4.** If the subsoil group is E, print caution statement about split or delayed N applications on sands (comment 35).

**Step 5.** If legume pasture, print applicable comment as determined by soil organic matter (comment 36 or 37).

**Step 6.** Print statements for specific crop codes (comments 11, 12, 14, 15, 16, 17, 19, 43) where applicable.

**Step 7.** Subtract fertilizer replacement credits for legumes and/or manure if appropriate.

### Secondary and micro-nutrient recommendations (when test performed)

**Step 1.** Consider soil test interpretation level.

**Step 2.** Consider relative crop nutrient need.

**Step 3.** Print interpretative level and recommendation in lower section of report.



## Special comments statements

(Not all numbers are used)

1. Calibration is not available for out-of-state samples. See local Extension advisor for recommendations.
2. The sulfur availability index is medium, confirm need for sulfur by plant analysis.
3. N.R. = Not required for calculation of lime requirement when the soil pH is 6.6 or higher.
5. If corn harvested for silage instead of grain add extra 30 lb  $P_2O_5$ /a to next crop.
6. Other test(s) were requested. Results of these test(s) will follow on a separate report.
8. If corn harvested for silage instead of grain add extra 30 lb  $P_2O_5$ /a and 90 lb  $K_2O$ /a to next crop.
9. Most  $P_2O_5$  and  $K_2O$  should be incorporated prior to seeding sod.
10. Because of excessively high P levels, no  $P_2O_5$  fertilizer or manure is recommended on this field.
11. Assumes about 30 lb/a of N applied for potatoes as starter. Reduce rate by 25% if petiole N test used.
12. Recommendations not available for requested crop; changed to "Miscellaneous."
14. If barley or oats are underseeded with a legume forage, reduce nitrogen by 50%.
15. Nitrogen applications for pasture should be split into 2 to 3 applications per year.
16. Apply after seedling emergence. May apply some nitrogen 2 weeks before sod harvest to darken color.
17. Reduce nitrogen rate by 10 lb/a for spring wheat.
19. Nitrogen recommendations for fruits are based on results of plant analysis.
21. Due to very high P levels reduce fertilizer or manure applications and raise high P-demanding crops.
25. Some parts of this field are more acid and may require additional lime.
26. Lime recommendation may not achieve desired pH in 3 years. Retest then and apply as recommended.
28. If lime has been applied in the last 2 years, more lime may not be needed due to incomplete reaction.
29. This field is irrigated. Fertilizer recommendations for irrigated fields made for top yield potentials. Retest every 2 years.
30. Retest fields used for these high value crops every 2 years.
31. Because of the low potassium buffering capacity of this soil, retest every 2 years.
32. This soil is not suited for apples or cherries.
33. This soil is not suited for alfalfa.
34. The yield goal specified is outside expected range. Recommendations reflect more typical yields.
35. The nitrogen recommendation should be applied in sidedressed or split application on sandy soils.
36. Apply 40 lb N/a in seeding year for legume pasture on sandy soils.
37. Apply 20 lb N/a in seeding year for legume pasture on medium organic matter soils.
41. Lime should be applied to orchards before planting. Adjustment of pH is impractical once established.
42. If corn harvested for silage instead of grain apply extra 90 lb  $K_2O$ /a to next crop.
43. N recommendation for oatlage or oat-pea forage assumes alfalfa underseeding.
44. Recommended soil pH for scab-susceptible potatoes is 5.2.

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